Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

Plant Breeding Abstracts

Vol. I, No. 4.

School of Agriculture
Cambridge
England

July 1st, 1931

IMPERIAL AGRICULTURAL BUREAUX

EXECUTIVE COUNCIL.
2, Queen Anne's Gate Buildings, London, S.W.1.

IMPERIAL BUREAU OF SOIL SCIENCE.
Rothamsted Experimental Station, Harpenden, Herts.

IMPERIAL BUREAU OF ANIMAL NUTRITION.
The Reid Library, Rowett Institute, Bucksburn, Aberdeen.

IMPERIAL BUREAU OF ANIMAL HEALTH.
Veterinary Laboratory, New Haw, Weybridge, Surrey.

IMPERIAL BUREAU OF ANIMAL GENETICS.
King's Buildings, University of Edinburgh, Scotland.

IMPERIAL BUREAU OF PLANT GENETICS (FOR CROPS OTHER THAN HERBAGE).
School of Agriculture, Cambridge.

IMPERIAL BUREAU OF PLANT GENETICS (HERBAGE).
Agricultural Buildings, Alexandra Road, Aberystwyth.

IMPERIAL BUREAU OF FRUIT PRODUCTION.
East Malling Research Station, East Malling, Kent.

IMPERIAL BUREAU OF AGRICULTURAL PARASITOLOGY.
Winches Farm, Hatfield Row, St. Albans, Herts.

The Imperial Bureau of Plant Genetics

Director: PROF. SIR R. H. BIFFEN, M.A., F.R.S.

Deputy Director: P. S. HUDSON, Ph.D.

Assistant: MISS R. M. TUPPER-CAREY, M.Sc.

Secretary: MISS E. E. PARR.

Plant Breeding Abstracts are issued quarterly at an inclusive price of 5/- per annum, single copies 1/6. Subscriptions or exchanges should be sent to the Deputy Director, Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, England.

Plant Breeding Abstracts.

Vol. 1, No. 4.

Part I. British Empire

GENETICS 575

448. **Hurst, C. C.** **575.245**

Speeding up plant breeding.

Emp. Cott. Grow. Rev. 1931 : 8 : 103–17.

An explanation in non-technical language of the principles of plant breeding, of spontaneous mutations and the theory of mutation. It is further shewn how translocations, if they involve portions of the chromosomes carrying valuable genes, may produce types of greatly enhanced value. Similar results are obtained by chromosome duplication, polyploidy induced either by X-rays or by crossing forms differing in chromosome number. Although the majority of mutant types derived from X-rayed individuals are useless, certain valuable new types have already been obtained and it is concluded that the increased variation brought about in this way will furnish valuable new material for the breeder.

449. **Stadler, L. J.** **575.253:537.531:576.356**

The experimental modification of heredity in crop plants. I. Induced chromosomal irregularities.

Sci. Agric. 1931 : 11 : 557–72.

The progeny resulting from pollination with irradiated pollen often shews defective endosperm or embryo, together with chromosomal deficiencies and lack of certain dominant characters of the pollen parent ; the lack of a whole group of linked characters is of frequent occurrence, indicating the lack of whole chromosomes or sections of chromosomes. The frequency of loss is almost proportional to the dose.

The reversion of small areas of endosperm to the dominant has not yet received an altogether satisfactory explanation. Certain gene deficiencies apparently result in defective endosperm or embryo development. There are differences in the frequency of loss of different genes.

Most deficiencies are lethal to the haploid pollen even if not to the diploid sporophyte. Hence selfing produces very few offspring, all of which are normal.

Other cases occur of partial sterility, which in contrast with the above is inherited. This would seem to have resulted from interchange of segments by two non-homologous chromosomes, which can often be detected by the formation of chromosome rings.

Irradiation of the flowers after fertilization results in endosperm chimaeras. These occur under natural conditions but irradiation greatly increases their frequency. When irradiation is performed more than 48 hours after fertilization the resulting plants have the form of chimaeras, the proportion of the plant having deficient tissue decreasing with the number of days after pollination. Treatment of the mature seed has similar results.

No chromosome duplication or indication of induced polyploidy has been found. A certain number of haploids have arisen.

450. **Sansome, F. W.** **575.257:576.356.5**

Graft hybrids and induction of polyploids in *Solanum*.

Rep. and Proc. 9th Int. Hort. Congr. 1930 : 92–99.

The question of periclinal and mericlinal chimaeras in general, and in *Solanum* in particular, is discussed briefly.

Experiments are then referred to in which it is shewn that the polyploid shoots often produced by graft hybrids can also be produced with ease by cutting back young, vigorously growing plants.

It is suggested that they arise by failure of wall formation in large, young cells before the next mitotic division sets in.

Various interesting phenomena have proved to be in accordance with the expectation of genetical theory in such induced polyploids in the tomato and it is thought that a valuable method for studying polyploidy has been discovered.

451. **McDonald, J.** **633.11–2.452:576.16(67.62)**
Investigations on stem rust of wheat in Kenya colony.
Bull. Dept. Agric. Kenya 1931 : 1 : 7 pp.

A short account of the work in which the presence of two, and possibly three, physiologic forms of the fungus, identical with two of the American forms, has been extablished. The hybrid Kenya Governor is resistant to only one of these.

452. **Jones, E. T.** **633.13**
New varieties and strains from the Welsh Plant Breeding Station, No. 2. Pure line strains of Ceirch Llwyd (*Avena Strigosa*) and Ceirch-du-bach (*A. sativa*).
Univ. Coll. of Wales, Leaflet Series S. No. 2. 1931 : 26 pp.

From the 140 heads of Ceirch Llwyd originally selected in 1921 and 1922 three strains were finally chosen for a closer study of their yield.
Earlier observations of panicle emergence and on date of ripening on 22 strains showed a marked range of dates, both earlier and later than the unselected variety.
Total yield (straw + grain), weight of grain and weight of straw for the three strains were compared with the original variety and all showed a satisfactory increase. This was combined in S. 78 with increased earliness of maturity and in S. 76 with marked resistance to lodging.
Less variation was found among Ceirch-du-bach and the increase in yield was less marked in the two lines finally selected, but was, nevertheless, an improvement on the commercial variety.

453. **Ramiah, K.** **633.18:575.11**
The inheritance of characters in rice, Part III.
Mem. Dept. Agric. Ind. Bot. 1930 : 18 : 211–27.

The F_2 was grown from a natural hybrid and as it shewed signs of segregation the entire F_3, consisting of 81 families, was examined for habit of growth. There were 19 families breeding true for spreading, 21 for compact habit and 41 segregating. The ratios in the segregating families conformed to a simple Mendelian expectation, with the spreading habit dominant. This was confirmed in F_4 and by the F_2 ratios of several other natural hybrids.
Crosses were made of the plants thought to have been the parents of the original hybrid ; the spreading habit proved to be dominant in F_1 and in F_2 the angle of deviation of the tillers from the vertical was measured. For the compact group the angle was the same as for the compact parent. Compact types were found to be more resistant to lodging than spreading types.
Albino segregates from crosses had often been observed and in certain crosses pale yellow plants, which although weak yet attained maturity, also appeared. Such plants bred true and the character was evidently recessive. Natural crosses from these with green plants were examined in F_2. Satisfactory 15:1 ratios were observed. Artificial crosses of pure yellow x pure green and pure yellow x heterozygous green tended to confirm these ratios, although certain deviations from the expected ratios were observed.
One plant was found in which some panicles possessed the normal purple glumes, three panicles in which some spikelets had green and others purple glumes and one panicle with only green glumes ; the plant proved to be a chimaera. The grains from these green spikelets, unlike those of normal green plants, segregated into purple and green. The colour change has therefore affected only the epidermis and is ascribed to a loss mutation in the gene G for purple glumes. That the factor for purple rice is distinct from that for purple glumes was proved by the appearance of a crossover plant with purple glumes and white rice. This plant gave 2:1 instead of 3:1 ratios for colour of glume and it is supposed that the G factor is associated with a lethal, such that the GG zygote is non-viable.

454. **Ramiah, K., Jobitharaj, S., and Mudaliar, S. D.** 633.18:575.11
Inheritance of characters in rice. Part IV.
Mem. Dept. Agric. Ind. Bot. 1931 : **18** : 229-59.

Although glutinous and non-glutinous pollen grains are produced in equal numbers in the F_1 hybrid, there is always a deficiency of glutinous plants in the F_2. This has been traced to a reduced germination capacity of the glutinous kernels. Decreased plant vigour is also associated with the character.

The progeny of a natural cross as well as of artificial hybridization between a short, round kernelled type and one with long kernels segregated in simple monofactorial ratios. The factors for spikelet length may be associated with kernel shape but are probably more complicated.

Lax x dense panicle segregated in a 3 : 1 ratio. The cross was not of economic value as sterility appeared among the progeny.

Clustering and non-clustering of the spikelets on the panicle behaved as a single pair of Mendelian characters. F_1 was intermediate.

The dense arrangement and the clustering of the spikelets on the panicle segregated independently in monofactorial ratios. The F_1 of the same cross was intermediate for panicle length, in F_2 the segregation was transgressive as was also the F_2 segregation for emergence of the panicle, which was associated with sterility ; plants with poor emergence showing greater sterility than those with good emergence.

With regard to duration, both F_1 and F_2 were intermediate and well within the range of the parent types.

Plants with even-colouration of the glumes crossed with plants with mottled glumes gave an intermediate F_1 and a 1 : 2 : 1 ratio in F_2.

The F_1 of the cross long v. short glumes was intermediate and the segregation in F_2 was 1 : 2 : 1.

An unpigmented plant with brown rice was crossed with a pigmented plant with white rice and F_1 was pigmented with purple rice. The F_2 results though not in close agreement with a 9 : 3 : 3 : 1 ratio showed that A, one of the pigmentation factors and P, the factor for purple colour must both be present to produce the purple colour and that P without A gives brown rice.

455. **Findlay, W. M.** 633.42–2.411.1–1.521.6
A disease-resisting turnip.
Scot. J. Agric. 1931 : **14** : 173–83

The history is given of a strain of turnip resistant to finger-and-toe. The characteristics of the strain and its behaviour under conditions of heavy infection are described.

456. **Mohammed, A., Singh, R. D., and Alam, Z.** 633.426:581.162.52
Some breeding investigations on Toria (*Brassica napus* L. var. *dichotoma* Prain) and Sarson (*Brassica campestris* L. var. *sarson* Prain).
Ind. J. Agric. Sci. 1931 : **1** : 109–36.

The mechanism of pollination is described for both species and is shewn to be rather unfavourable to self-pollination. Cross-pollination by insects is the rule. The influence of weather on insect visits and consequently on pollination is studied in detail. Weather conditions are seen to exert a considerable influence on yield in this way. One yellow-seeded variety of *B. campestris* was more prone to self-fertilization than any other variety of either of the two species studied.

The percentage set in bagged plants was 12·1 and 20·1 for *B. napus* and *B. campestris* respectively. In addition to this the pods which set are found to have a reduced number of seeds. The number of pods setting and seed production under bags was increased by artificial self-pollination, from 14·5 and 27 per 100 flowers to 33·6 and 90 respectively. The figures for free pollinated plants were 66 and 1,086 respectively, shewing that even with artificial pollination, the set is extremely low. Cross-pollination under bags gave the best set of all. The only variety whose set was not affected in this way was the above yellow-seeded variety of *B. campestris*.

The progeny of selfed plants proved to be much less vigorous than cross-fertilized plants.

It is concluded that improvement of these crops will only be attained by mass crossing and a list of desiderata is given, on which the choice of parent types must rest.

Reddish coloured seeds were found to weigh less than those of a blackish colour. The proportions of the respective types varied in different parts of the inflorescence.
A number of crosses were made of these two species with each other and with other species. *B. campestris* crossed readily with *B. napus*, turnip and mustard, and *B. napus* with turnip. *B. campestris* also crossed with *Eruca sativa* when used as the female parent, giving very limited numbers of normal seeds.

457. **Salaman, R. N.** **633.491:575.252**
Somatic mutations in the potato.
Rep. and Proc. 9th Int. Hort. Congr. 1930 : 117–40.
A modification of Asseyeva's method was used in a repetition of her experiments on Arran Victory and other varieties. The results on the whole were mainly negative and led to the suggestion that a mutation probably of the gene R, the colour producing factor, occurs in the somatic tissues of the stolon, giving rise to irregular groups of cells, with and without the factor. Buds, arising from these groups will bear tubers showing corresponding mutations.
The abnormal leaf-form of the variety Di Vernon was shown to be chimaerical and buds induced from the deeper layer were normal.

458. **Salaman, R. N.** **633.491–2.8–1.521.6**
The Potato Virus Research Institute.
Camb. Univ. Agric. Soc. Mag. 1931 : **3** : 18–26.
A general account of the Institute and the problems which it has to face. Amongst other things the questions of the inheritance of the disease through the seed, the selection of virus-free stocks, the genetics of resistance to blight (*Phytophthora infestans*) are discussed.

459. **Jagannatha Rao, C.** **633.51:575.14**
The immediate effect of artificial self-fertilization on some economic characters of the cotton plant.
Madras Agric. J. 1931 : **19** : 113–19.
A certain number of flowers were artificially selfed and the remaining ones left free to natural pollination. The flowering and bolling curves shewed no appreciable differences between the two lots and no differences were observed in respect of the following boll characters : ovules per lock, seeds per lock, fertility index, lint length, kapas weight per seed, lint weight per seed, seed weight and ginning percentage.

460. **Shaw, F. J. F., Khan, K. S. A. R., and Alam, M.** **633.52:575.11.061.6**
Studies in Indian oil-seeds. V. The inheritance of characters in Indian linseed.
Ind. J. Agric. Sci. 1931 : **1** : 1–57.
By examining the flowers after 11 a.m., when the plants had been exposed to the sun, it was possible to make a detailed study of the inheritance of colour in the stamen filaments, style and stigma. A full factorial analysis was made of these characters in addition to the petal and seed colours. Twelve different crosses, involving different combinations of seven parental types, were studied in F_2 and F_3.
Blue colour in the petal depends on the interaction of several factors. Lilac is recessive to blue and pink is recessive both to lilac and to white with pink tinge. Colour in the other organs studied is dependent on some of these factors and on others which determine the colour in the organs individually. A total of 17 factors is assumed in order to explain the results obtained. On this basis a factorial constitution is assigned to each of the parental types, on the basis of which each cross is discussed in turn, shewing how the factorial explanation agrees with the observed results.
Certain of the combinations shew a deficiency of the double recessive class.
The present authors' interpretation differs from that of Tammes in that only two basal factors for colour are postulated and an additional factor, which reduces colour intensity, is substituted for Tammes' intensifying factor A. A few further differences of a minor nature are suggested in order to bring Tammes' scheme into agreement with the present results.

A particular group of three of these colour factors is found to influence the character " crimped petals." Here again the results differ from those reported by Tammes in that all three factors are found to be necessary to produce the crimping. A further factor B prevents crimping whenever it is present.

The factorial interpretation of seed-coat colour also differs from the scheme proposed by Tammes in that the basal colour is regarded as yellow, G, or G and M, converting this into grey and D (one of the factors for petal colour) further converting grey into brown ; factors M and D in absence of G give fawn. A further intensifier, X, is linked with the factor D for flower colour. The results for anther colour agree with the interpretation of Tammes, whereby a factor H interacts with two petal-colour factors B and D.

The colour in filaments depends on three factors, two duplicate basal factors Z_1 and Z_2 with an inhibitor T which limits the colour to the distal end ; certain of the petal-colour factors must be present for colour to be produced.

The colour of the styles is influenced by some of the petal-colour factors and it is assumed that a basal factor R is also necessary for the expression of colour. The stigma colour depends on a factor P for pink colour, influenced by certain of the petal-colour factors ; an inhibitor I also exists.

A large number of new types have been isolated from these crosses and the most promising of them are being tested for yield and oil content.

461. **Venkatraman, T. S.** **633.61:575(54.8)**
Coimbatore seedling canes. (Co.281 and Co.290 described and illustrated).
Agric. and Live-stock Ind. 1931 : **1** : 128–34.

The pedigrees, together with a brief account of the production, followed by a detailed description for identification purposes, are given of two canes produced at the Imperial Sugarcane Breeding Station, Coimbatore, and which have been extensively taken into cultivation in India and elsewhere. The first of the two canes is very early in ripening, has a high sucrose content, is resistant to cold, root diseases and mosaic and immune from leaf spot.

The second cane is early, high yielding and highly resistant to mosaic.

462. **Dutt, N. L., and Krishnaswamy, B. A.** **633.61:581.466**
A preliminary note on stigma receptivity in certain sugarcane varieties.
Ind. J. Agric. Sci. 1931 : **1** : 286–88.

The percentage of germination of fresh pollen dusted on to stigmas of a number of different varieties was noted. Successful germination was obtained on five-day-old stigmas and a certain amount up to the eleventh day.

463. **Milsum, J. N., and Greig, J. L.** **633.855.34:581.162.3**
Pollination of oil palms under field conditions.
Malayan Agric. J. 1931 : **19** : 123–27.

The results of artificial pollination carried out for four years, starting when the palms first began to bear fruit, are reported. The average bunch from both experimental and control sets when naturally pollinated was the same but the artificially pollinated palms shewed an increase of 103·9 per cent. in average weight per bunch.

464. **Wellington, R.** **634.1/2:581.162.3**
Present status of fruit pollination studies in the United States and Canada.
Rep. and Proc. 9th Int. Hort. Congr. 1930 : Group B : 297–304.

A brief reference to all the more important work recently published and in progress.

465. **Crane, M. B., and Lawrence, W. J. C.** **634.1/2:581.162.5**

Studies in sterility.

Rep. and Proc. 9th Internat. Hort. Congr. 1930 : 100–16.

Vegetative propagation in fruit trees has permitted various phenomena of sterility to be perpetuated. Three types of sterility, generational, morphological and incompatibility, are defined. All the cherry varieties are self-incompatible and cross-incompatibility is common amongst them. It has been possible to establish nine incompatibility groups within which all self- and cross-pollinations fail. Reciprocal crosses frequently shew different degrees of incompatibility. Domestic plums were arranged in three classes, viz., completely self-incompatible, partially incompatible, so as to be incapable of producing a satisfactory crop with their own pollen, and completely self-fertile. A number of varieties are referred to these three classes.

The cross incompatibility groups are established but this is not so pronounced in the plums, being hexaploid, as in the cherries.

The observations shew that varieties with an even number of chromosome sets tend to be more fertile than those with an odd number. This is illustrated with reference to a number of other fruits.

In apples it is shewn that the pollen is more sterile in triploid than diploid varieties. It is further pointed out that these diploids are really tetraploid with respect to four and hexaploid with respect to three chromosomes, the basic number being 7 ; the triploids are partly hexaploid and partly nonoploid. As a result of this greater chromosomal heterogeneity the triploids give better results in crossing than the diploids, in spite of their greater pollen sterility. The seed content is greater however in diploid x diploid combinations and the progeny is more vigorous.

Cases of other forms of sterility, such as the lack of male or female organs or both, are referred to and the practical application of these facts indicated. These investigations combined with genetical studies suggest that the common plum has originated by chromosome doubling in hybrids of diploid and tetraploid species, probably *P. cerasifolia* and *P. spinosa*.

466. **Vavilov, N. I.** **634.1/7:576.16**

Wild progenitors of the fruit trees of Turkistan and the Caucasus and the problem of the origin of fruit trees.

Rep. and Proc. 9th Int. Hort. Congr. 1930 : Group B : 271–86.

The extraordinary richness and diversity of wild fruit trees in the Caucasus is pointed out and a list of the most interesting species given. This region contains the centre of distribution of several important fruits, e.g. *Cydonia oblonga*, *Punica Granatum*, *Prunus divaricata* and *Cerasus avium*. Many other species which have a much wider distribution are also extremely rich and diversified ; no less than 80 wild species of different fruits and nuts occur together. The characteristics of the distribution of certain of these are discussed.

The indigenous grape varieties of Transcaucasia shew the whole scale of diversity in colour, size of fruit and seeds, and this is regarded as the centre of origin of the cultivated grape.

Turkestan is as rich as the Caucasus in number of species, but the diversity within the species is not quite so wide. The species here also have their characteristic geographical distribution. Great variability of wild almonds occurs, both bitter and sweet types being found, including types with quality as high as cultivated varieties. The same is true of wild apples and also many other species which are discussed in less detail.

Hybridization occurs between the enormously diversified forms and species compressed within these small areas and it seems probable that cultivated types have arisen by hybridization between a number of different species. Even intergeneric hybrids are of frequent occurrence.

Other important points established are the reduction in variability and of dominant characters on passing away from these centres, the number of transitional forms which occur between the wild and cultivated types, and the prevalence of gigantism, a phenomenon not yet entirely explained.

Part II. Foreign.

GENETICS 575

467. **Roodenburg, J. W. M.** **575:578.082**
Kunstlichtkultur.
(Artificial light culture.)
Angew. Bot. 1931 : **13** : 162–66.
A condensed account in German of the Dutch paper already abstracted as No. 135 of Plant Breeding Abstracts Vol. I.

468. **Sapehin, A. A.** **575.127.2**
(The genetics of interspecific crosses.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 19–26.
A review of some of the important recent work on the subject.

469. **Voskresenskii, N. M.** **575.243:537.531**
X-ray and mutations.
Priroda, Leningrad 1930 : 494–507.
The author considers that the mutation phenomena produced by X-rays represent not only pathological states but sometimes normal, though exceedingly rare, states. By the use of X-rays many valuable phenomena may be hastened and brought to light.

470. **Navashin, M.** **575.243:537.531:576.356**
A preliminary report on some chromosome alterations by X-rays in *Crepis*.
Amer. Nat. 1931 : **65** : 243–52.
The average mutation rate was increased 600 times by the treatment. Fusion of chromosomes never occurred except in chromosomes which had suffered fragmentation. Parts of any chromosome, of any size, might be transferred to any other chromosome. The number of kinetic constrictions remained constant, so that the chromosome number also remained constant. It seems that such phenomena may have played an important role in species formation.

471. **Koltzov, A. V., and Koltzov, L. I.** **575.243:539.16**
(Radioactivity in plant industry.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 307–16.
The action on the plant of the various radium emanations is described. It is concluded that alpha rays as well as beta rays may be powerful agents in bringing about translocations.

472. **Stadler, L. J.** **575.246:633.15**
Recovery following genetic deficiency in maize.
Proc. Nat. Acad. Sci. Wash. 1930 : **16** : 714–20.
Chromosomal or sectional deficiency in the endosperm occurs with low frequency normally but is increased by treatment with X-rays, which also cause deficiency in the embryo.
In deficient endosperm tissues spots of normal tissue frequently occur ; when the deficiency involves a number of genes the " recovery " includes all the genes affected. The phenomenon was also observed in a seedling (sporophyte) as well as in the endosperm and in untreated mutants as well as in mutants resulting from X-rays. .
The explanation offered is that deficiency has been the result of the loss on the part of a chromosome, of the power to divide. If it later recovers this power a small island of normal tissue will be formed by the progeny of the cell in which this occurs.

473. **Kostoff, D.** **575.253:575.12**
Hybrid mutation, chromosome aberration and sterility in pepper (*Capsicum*).
Minist. Agric. and Nat. Domains Farm.–Econ. Lib., Sofia Univ. Bulgar., 1931 : No. **42** : 45 pp.

The F_1 between two homozygous red peppers was intermediate with regard to capsule shape ; there were irregularities of meiosis, which increased under reduced or raised temperature conditions, resulting in abortive pollen grains. The chromosome number was 12/24 as in the parent. In F_2 two mutant plants occurred. One had two instead of three carpels and died. The other had orange capsules.
Certain of the abnormal plants resulting from temperature changes on selfing gave plants with many abnormalities of chromosomes and of pollen. One plant had 25 somatic chromosomes and was partially fertile, another eleven haploid chromosomes and was sterile.
In winter the pollen tube of the yellow mutant grows very slowly and does not reach the ovule, sometimes inducing parthenocarpy. In summer normal fertilization takes place.
The chromosomal irregularities are thought to be due in the first place to the stimulus of the hybridization.

474. **Bleier, H.** **576.312.3:575.127:633.11**
576.312.3:575.127:633.14
Untersuchungen über das Verhalten der verschiedenen Kernkomponenten bei der Reduktionsteilung von Bastarden.
(Investigations on the behaviour of the different components of the nucleus during the reduction division in hybrids.)
La Cellule 1930 : **40** : 85–144.

The reduction divisions in the pollen mother cells of the hybrids of *Triticum vulgare* x *Secale cereale*, *Aegilops ovata* x *Triticum villosum*, *Aegilops ovata* x *T. durum*, *Ae. ovata* x *T. monococcum*, *Ae. cylindrica* x *T. durum* were cytologically investigated.
The theory is advanced that not only the chromosomes but also the component substance of the nucleus from which the spindle is formed, which normally surrounds the chromosomes so providing them with a medium without which they are incapable of existing and for which the term ' paragenoplastin ' is suggested, is autonomous. This is borne out by the presence of bi- and tri-polar spindles in the heterotypical divisions of many intergeneric hybrids and especially by the observations that in some cases the number of chromosomes on the separate spindles corresponds to that of the respective parents.
Up to the reduction division the developmental cycle of chromosomes and paragenoplastin of the two parents, although autonomous, may synchronize but if pairing fails to occur the speed of the cycle of the univalents falls behind that of the bivalents. The movement of the chromosomes only takes place if separation occurs between the halves of the univalents or between the bivalent pairs and a new theory is needed to explain the phenomena in hybrids.
Only one nucleolus has so far ever been observed and it is therefore assumed that there is no hindrance to the union of the two in the hybrid cell. The position of the spindle is determined by the polarity of the cell which is most marked in somatic cells and may be much reduced in the pollen mother cells. The individuality of the paragenoplastin surrounding the chromosomes suggests a possible explanation for vegetative mutations in hybrids.

475. **Brieger, F.** **576.312.332**
Geschlechtschromosomen im Pflanzenreich.
(Sex chromosomes in the plant kingdom.)
Der Züchter, 1931 : **3** : 83–92.

An account of the conclusions of Correns and others. Sex in plants is determined by one set of basal factors, the A complex causing maleness, the G complex femaleness and the Z complex influencing the degree of expression of either of these 2 factors. An individual of the type AAGGZZ will be neuter and the sex of such may be influenced by so-called " differentiators " or " realizers." Correns assumes two allelomorphs, one male-forming and one female-forming, epistatic to the basal genes. When the male-forming gene is dominant the male is heterozygous ;

Fragaria is the only well established example of a heterozygous female. In the view of a number of other authors no such sharp distinction between the action of the two types of gene exists but the two systems are supposed to produce opposite effects. Such a hypothesis accords more nearly with the observations on sex chromosomes.
For the demonstration of sex chromosomes an examination of both sexes is necessary.
In the X–Y type the heterozygous sex is characterized by the pairing of two unlike chromosomes ; in the X–O type the heterozygous sex has a single unpaired chromosome. There may be more than one such unpaired X chromosome all of which correspond to one Y chromosome or vice versa ; cases are known in which the Y and O types occur together.
The most frequent type in plants is the X–Y type.
Short discussions follow on certain cases of sex chromosomes in plants, including the lower plants, and of the secondary hermaphrodites, derived from forms possessing sex chromosomes. In many of these the cytological relations are not different, the hermaphroditism being evidently caused by some other factors affecting the genotype.
The phenomenon of heterpycnosis, in which the sex chromosomes are more deeply staining and where parts of certain chromosomes in monoecious species shew the same phenomenon, is also discussed.
A study of sex chromosomes makes it possible for the breeder to know which sex is heterozygous and has contributed much to a fuller understanding of the laws of inheritance.

476. **Kattermann, G.** **576.356:575.127**
Ueber die Bildung polyvalenter Cromosomenverbände bei einiger Gramineen. (On the formation of polyvalent chromosome groups in some Gramineae.)
Planta 1931 : **12** : 734–74.
A cytological investigation of meiosis in the pollen mother cells of *Anthoxanthum odoratum* var. *typicum* Beck revealed the occurrence of, besides uni- and bivalents, polyvalent chromosome groups of various kinds.
These persisted up to the first anaphase when the haploid number of ten separate chromosomes could be clearly distinguished. The behaviour of the chromosomes is explained by the hypothesis of segmental interchange between non-homologous chromosomes and thus provides another example of structural hybrids.
Quadrivalents were observed in the pollen mother cells of *Avena elatior* L. which is ascribed to autotetraploidy.
Polyvalents were present in F_1 plants of the crosses *Triticum durum* var. *affine* x *Aegilops ovata typica* and *Triticum vulgare* var. *lutescens* x *T. durum* var. *hordeiforme* also in the F_6 plants of a cross between a speltoid form of *T. vulgare* x *Aegilops ovata*.
The haploid number of 28 was established for *Bromus erectus* and polyvalent chromosomes were present.

BOTANY 581

477. **Yasuda, S.** **581.162.52**
Some additional experiments concerning the fertilizing power of Petunia. II. Supplementary note on the relation between the soil moisture and fertilizing power.
Bot. Mag. Tokyo 1930 : **44** : 191–95.
Under dry conditions Petunia is more self-compatible than under wet conditions. This has been shewn to result from the reduction of stylar secretion and not from parthenogenesis.

478. **Yasuda, S.** **581.162.52**
Physiological researches on the fertility of *Petunia violacea*. VII. On the cause of the so-called "End-season fertility."
Bot. Mag. Tokyo 1930 : **44** : 392–403.
The reason for the increased self-fertility in old plants is found to be in the greater ease with which the pollen germinates and the larger pollen tube. The differences were greater in more self-incompatible plants and were not observed in self-compatible plants. It is concluded that the inhibiting action of stigmatic selection in self-incompatibles decreases with age.

479. **Yasuda, S.** **581.162.52**
Physiological researches on the fertility in *Petunia violacea*. VIII. On the self-fertilizing ability of flowers in buds of the self-incompatible plants.
Bot. Mag. Tokyo 1930 : **44** : 678–87.
Pollination of still unopened flowers is more successful than of fully opened flowers. The growth of the pollen tubes down the style was more rapid and more regular in the younger flowers. The author concludes that the inhibiting substances are not yet formed in such flowers.

ECONOMIC PLANTS 633

480. **Vilmorin, R. de** **633:575**
633.11:575
633.41:575
Les plantes de grande culture, méthodes de sélection et création de variétés nouvelles.
(Crop plants, methods of selection and creation of new varieties.)
Bull. Soc. Enc. Ind. Nat. Paris 1930 : **129** : 779–92.
A simple exposition of plant breeding methods, described in great detail for two plants of different types, wheat and beet.

481. **Broekema, C.** **633:576.16**
Plantenveredelingsvraagstukken. II. Over de afstamming der cultuurplanten.
(Plant breeding questions II. On the origin of cultivated plants.)
Landbouwk. Tijdschr. Groningen, 1931 : **43** : 15 pp.
The three wheat groups based on chromosome number are discussed, then the Russian discoveries of the geographical concentration of gene diversity in the case of wheat and other plants, pointing out the difference between certain groups of cultivated plants which have developed from weeds and those which have originated in some other way.
The " Law of Homologous Variation " and the coincidence of the centres of variability for different plants and the fact that they occur always in mountainous regions are discussed.

482. **Theilung, A.** **633:576.16**
Die Entstehung der Kulturpflanzen.
(The origin of crop plants.)
Naturw. u. Landw. 1930 : **16**.
A book in which the author's views on the origin of crop plants from their wild progenitors are discussed.

483. **Vavilov, N. I.** **633:576.16**
(The problems of the origin of cultivated plants and domestic animals, as conceived at the present time.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 5–18.
The aim of the present day geneticist it to retrace the historical process of form differentiation so as to be able himself to create new forms.
The question of the original habitat of our cultivated plants is discussed. It is pointed out that this does not correspond to the place where wild forms now grow. Six regions are distinguished as centres of differentiation.
More recent investigations in more detail have shewn that certain extremely small areas shew extreme richness in forms of very many of our cultivated plants, together with a high proportion of primitive characters. These small areas often contain genes, varieties or species occurring in no other part of the world. Such areas in Central and South America contain whole groups of species and even genera, peculiar to these regions ; the Western spur of the Pyrenees has disclosed scores of varieties of *Avena brevis* and *A. strigosa*, where only two to three were known previously.

The importance to the breeder of discovering these areas for all cultivated plants is emphasized. The forms of these areas, although outwardly they may be very uniform, on analysis are frequently found to contain all the genes present in the most diverse cultivated species. As such they are of little use for cultivation but their valuable elements must be extracted by hybridization, selection, etc. In many cases on the other hand, e.g., barleys from Abyssinia, some of the new forms discovered are of great value for immediate cultivation in certain districts.

A certain number of cultivated plants have much less restricted areas of form diversity; these are in the minority. Important results are expected from the gradual classification of species according to this degree of restriction.

At the centres the great majority of characters (and genes) are dominant and the number of recessives increases on passing away from the centre. This process often leads to the development of valuable new characters and forms.

In the centres forms frequently occur in which the characters later to be regarded as specific have not diverged—wheats with chromosome number of hard wheats and the external characters of soft wheats and so on.

The discovery of the origin of polyploids in interspecific crosses involving differences in chromosome number sheds additional light on the process of differentiation of species and forms, and the experimental production of mutation seems to be a further step in the art of creation of forms.

484. **Ducomet, V.** **633.0014:519,251.9**
Essais comparatifs de rendement.
(Comparative yield tests).
Bull. Assoc. Int. Sélect. Plantes 1931 : **4** : 39–49.

A simplified method of calculating the error is suggested, involving a constant whose value varies with the number of replications.

485. **Papadakis, J.** **633.0014:581.5**
Varieties experiments in countries with great variability in ecological conditions from year to year.
Bull. Assoc. Int. Sélect. Plantes 1931 : **4** : 71–75.

The necessity for carrying out the tests in a number of different places with different conditions is emphasized and a number of ways in which this can be done is suggested.

486. **Papadakis, J.** **633.0014–1.421**
Some considerations on the technique of field experiments.
Bull. Assoc. Int. Sélect. Plantes 1931 : **4** : 59–66.

An improved method is suggested, in which the effect of soil heterogeneity can be eliminated by the use of large numbers of check plots of a standard variety.

487. **Dendrinos, A. D.** **633.0014–1.421**
The question of the shape of plots in field experimentation.
Bull. Assoc. Int. Sélect. Plantes 1931 : **4** : 106–13.

It is shewn that the reduced variability obtained by the use of oblong plots occurs only in the case of small fields and not in experiments done *in extenso*.

488. **Garber, R. J., McIlvaine, T. C., and Hoover, M. M.** **633.0014–1.421**
A method of laying out experiment plats.
J. Amer. Soc. Agron. 1931 : **23** : 286–98.

489. **Klages, K. H.** **633.0014–1.421**
A modification of Delwiche's system of laying out cereal variety test plats.
J. Amer. Soc. Agron. 1931 : **23** : 186–89.

A modification of Delwiche's scheme is suggested by which two instead of six drill rows are grown in the alleys between adjacent plots. This method was found to eliminate the necessity of cultivated alleys between plots, to cut down border effects and to reduce the possibilities of exaggerated yields.

490. **Martinet, G.** **633.1:575(49.4)**
Résultats d'essais avec diverses céréales sélectionnées.
(Results with tests of various selected cereals.)
Ann. Agric. Suisse, 1931 : 32 année : 79–96.

The author emphasizes the excellence of the ancient local varieties and their extreme value as a basis of selection. Amongst the varieties of oats tested a number of early maturing ones adapted to the conditions of altitude were selected. Two of these were crossed in 1913 in order to increase the earliness and adaptation. Two very early forms occurring in F_3 and F_5 respectively proved constant and identical. Later an identical plant also occurred, apparently as the result of mutation, in an ordinary culture of one of the parents in a rigorous climate. This line matures 8 days earlier than other early oats, its yield and grain are good and straw short, resistant to lodging. It has been named Soldanelle. The author has observed other cases of early mutations, resulting from change of climate. One of these, Primavère, gave an extremely high yield, was almost as early as Soldanelle and also had strong straw. A further mutation with brown grains, from a white-grained stock, is reported. This line is highly vigorous and resistant to cold and lodging. It is as early as the parental strain.
A line selected from a mixed sample of Kherson was equal to Soldanelle in earliness and yield.
A peculiar type of oat with grey grains, agriculturally of little value, has begun to arise in many places, most frequently in mountainous zones.
By selection from a local variety a line of barley has been isolated in which earliness, hardiness, yield and lodging resistance are combined.
Selection of spring wheat and rye on similar lines is also reported.

491. **Piescu, A.** **633.1:575.42:576.341**
Selektionsversuche nach der Saugkraft an einigen landwirtschaftlichen Kulturpflanzen in Rumänien.
(Experiments on selection for osmotic pressure in certain agricultural crop plants in Rumania.)
Fortschr. Landw. 1931 : **6** : 299–305.

Wheat and barley grains were germinated in 60 per cent sugar solution. The plants which germinated first and therefore with higher osmotic pressure proved to have considerably greater frost resistance, weight of plant and of grain and vigour of the plant in general.
Similar results were obtained in preliminary tests with a number of other plants and such methods are regarded as very valuable in breeding.

492. **Christiansen-Weniger, F.** **633.11**
Erster Bericht über Untersuchungen an Landweizen aus Schlesien, West-Kongresspolen und Galizien.
(First report on the investigations on land wheats from Schleswig, West Poland and Galicia.)
Der Züchter, 1931 : **3** : 61–73.

The variations in climate and soil in the area under examination are discussed.
The types of wheats encountered and their relation to climatic conditions are then discussed.
Awned wheats, with higher protein content, were found in regions having a highly continental climate.
It was hoped that amongst these land races characters would be found which have been lost in the high yielding wheats of the breeder.
In this respect certain types with short, strong straw and long ears were of particular interest.
The progeny of the forms collected shewed wide variations and the material is considered to be a valuable basis for combination by breeding, especially for types for light soils.

493. **Stewart, G., and Woodward, R. W.** **633.11:575.11**
Inheritance in a wheat cross between hybrid 128 x White Odessa and Kanred.
J. Agric. Res. 1931 : **42** : 507–20.
The inheritance of awn length, density and grain colour was studied in F_1 to F_4 of a cross made with the object of producing smut resistant plants.
Clear Mendelian ratios were obtained for awn length, the parents differing in one factor. The F_1 was intermediate. For density of the ear, coefficients of variability were taken ; by this means the segregates could be clearly separated into three groups, conforming closely to a 1 : 2 : 1 ratio. Bunt is shewn to have a lengthening effect on the denser ears, making them appear lax.
Three independent factors were shewn to exist for grain colour.

494. **Regot, G. A.** **633.11:575.11:581.46**
(A contribution to the question of the genotypical composition of *Triticum vulgare* Vill. in the character of awnedness.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 413–18.
The F_2 of crosses of awned by awnless wheats gave a ratio approximating to 9:7. Two (dimeric) factors exist, one of which must be present in homozygous condition for the development of awns.
The awnless plants gave an F_3 in which the ratio of awned to awnless agreed with the expected 1 : 2 : 27.
One of the crosses gave monohybrid ratios.

495. **Dekaprelevich, L. L.** **633.11:575.113.7**
(On the obtaining of non-vital and semi-vital combinations in wheat crosses.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 221–27.
Almost all plants of the F_1 of *Triticum vulgare v. velutinum* x *T. compactum v. erinaceum* died at some stage or other before coming into ear. The *vulgare* parent gave similar results also with certain other varieties of *T. vulgare*. The crosses involving these parents were divided into 3 groups : those giving entirely non-viable progeny, those in which only half the progeny survived, and crosses in which the F_1 was normal.
In those crosses where progeny was obtained from the F_1, segregation occurred in F_2.
Certain genes are evidently present which, when combined with certain other genes, produce some sort of lethal effect on the chlorophyll.

496. **Florell, V. H.** **633.11:575.127**
633.14:575.127
A genetic study of wheat x rye hybrids and back crosses.
J. Agric. Res. 1931 : **42** : 315–39.
Varieties of hexaploid wheats were easily crossed with Rosen and Dakold rye. The F_1 showed both dominant and intermediate wheat and rye characters and was completely self-sterile. F_1 was then backcrossed to wheat and the resulting progeny backcrossed again or selfed. The plants became increasingly fertile and wheat-like. Parental types were recovered in the second and third generations of the second backcross. The plants with rye characters all shewed reduced fertility and segregation for the rye characters, except one strain with red kernels and one with hairy-neck.

497. **Meister, G. K.** **633.11:575.127**
633.14:575.127
(The present purposes of the study of interspecific hybrids.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 27–43.
The results of interspecific crosses shew that new forms arise not by the addition of whole chromosome sets but by the inclusion of one or two chromosomes only or even of fragments of chromosomes. Non-segregating wheat-rye hybrids have been obtained which were intermediate in type. Two of these cytologically examined were found to have 56 chromosomes.
On the whole, the vegetative characters of the mature plant resembled those of winter wheat and the new species has been named *Triticum secalotricum Saratoviense* Meister.

498. **Meister, N. G.** **633.11:575.127**
633.14:575.127

(On the form building process in the rye-wheat hybrids of the wheat group.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 369–80.

The wheat-like segregates of the crosses of ordinary awned, Indo-European wheat varieties with rye were examined from the point of view of a number of ear characters. All characters, with very few exceptions, associated with the soft wheats were found amongst these segregates and it is thought that rye has played a part in the origin of soft wheats.

The segregates can be divided into the coarse Asiatic type and the Indo-European type, each of which contains forms with pubescence beneath the ear (a rye character) and wild type.

The coarse Asiatic types are divided into *rigidum*, the original coarse wheat type with tight glumes, *diccocciforme* and *speltiforme*. These groups are again subdivided into a number of different sub-groups and further into so-called complex races. The characteristics of these various sub-groups are given and the process illustrated in tabular form. One sub-group in most cases shews affinities to the Indo-European section.

The Indo-European section is similarly subdivided into three groups, the first being a transitional group from the Asiatic section, the third the group of highly cultivated type. These are subdivided as before. The wheats of the last cultivated group are highly productive, very early ripening types and amongst these there are already constant families shewing a high degree of winter hardiness. Some have perfectly glassy grains, the majority semi-glassy. From this group five awned and seven non-awned complex races have been isolated, of which three are of the squarehead type.

499. **Oehler, E.** **633.11:575.127**

Die Ausnutzung von Spezies– und Gattungskreuzungen in der Weizen– und Roggenzüchtung.
(The utilization of species and genus crosses in wheat and rye breeding)
Z. indukt. Abstamm.– u. VererbLehre 1931 : **57** : 363–69.

A brief discussion, from an historical point of view, of the various species and genus crosses which have been investigated in wheat, from which the author concludes that although the practical results have so far not been great they have been such as clearly to illustrate the practical value of these lines of investigation.

500. **Popova, G. M.** **633.11:575.127**

(Interspecific crosses in the genus *Aegilops* L.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : p. 397.

Seven crosses were made involving different species of *Aegilops* and *Triticum*. The degree of success is indicated.

501. **Tjumjakoff, N. A.*** **633.11:575.127**
633.14:575.127

(Fertility and comparative morphology of the rye-wheat hybrids of balanced type.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 497–508.

A special study was made of the segregates which were intermediate between the two parental types. The majority of these were completely or almost sterile but in one year when particularly large numbers were available certain intermediate plants behaved quite differently and were characterized by a high degree of fertility. Both were almost identical with the F_1 and cytological examination shewed them to have 56 chromosomes; they are evidently balanced, fertile allotetraploids of the type represented by *Aegilotrichum*. No segregation occurred in F_2, F_3 or F_4, which were intermediate in respect of almost all characters examined.

The percentage of normally developed pollen grains was lower in F_2 than in the parents but increased in F_3 and F_4. The grains were of the rye type but there was very great variation in grain weight.

*** A full translation of this paper is filed at the Bureau.**

502. **Florell, V. H.** **633.11:575.127:576.35**
633.14:575.127:576.35

A cytologic study of wheat x rye hybrids and backcrosses.
J. Agric. Res. 1931 : **42** : 341–62.

Some of the material derived from the experiments described in the previous paper were cytologically investigated, chiefly that of Hybrid 128 (*Triticum compactum* Host) x Rosen rye and their backcrossed progeny. From 0–3 bivalents with 28–22 univalents were found in the pollen mother cells of the F_1 hybrids.

In somatic counts of some F_3 plants of the backcross those with white kernels had 42, those with red kernels 43 and 44 chromosomes. Division was practically normal in the pollen mother cells and except for the univalent chromosomes in the 43 chromosome plants.

In another family segregating for hairy neck and length of kernel there were plants with 42, 43, 44, 45 and 47 chromosomes: 20–22 bivalents and 1–5 univalents.

Fertility increased as the numbers of rye chromosomes decreased. There seems to be the possibility of a stable combination of a pair of rye chromosomes with the wheat complement in the hybrids.

503. **Kihara, H.** **633.11:575.127:576.356**

Genomanalyse bei *Triticum* und *Aegilops* II. *Aegilotricum* und *Aegilops cylindrica*.
(Genom analysis in *Triticum* and *Aegilops* II. *Aegilotricum* and *Aegilops cylindrica*.)
Cytologia, 1931 : **2** : 106–56.

The chromosome number for *Aegilotricum* agreed with that reported by Bleier ; the closeness of conjugation in the gemini was variable, a few univalents being observed.

Crosses were made of *Aegilotricum* with *Ae. ovata*, *T. dicoccoides* and *T. spelta*, the hybrid in each case having the expected chromosome number, which shews that *Aegilotricum* has the reduced chromosome number of 28.

In the hybrid *Aegilotricum* x *T. dicoccoides* 14 bi- and 14 univalents were regularly observed, although numbers of bivalents varying from 10 to 14 occurred ; the closeness of conjugation was much as in *Aegilotricum* itself. The hybrid with *T. spelta* displayed varying numbers from 7 to 14 bivalents, the closeness of conjugation being somewhat less in this case. A similar closeness of conjugation occurred in the hybrid with *Ae. ovata*, in which the number of bivalents approached 14, the univalents 14.

From these facts it is concluded that *Aegilotricum* possesses the 2 emmer genoms A and B together with the 2 *ovata* genoms C and E.

Hybrids between *Ae. cylindrica* and *T. durum* and of each of these with *T. vulgare* were examined. In the first of these crosses 0–8 bivalents, loosely united, were observed. Examination shewed that the number of combinations increased from early to late metaphase. The hybrid *Ae. cylindrica* x *T. vulgare* shewed 5–9 gemini, 7 was by far the commonest number and when more were present the extra ones were much less closely united. The genom D which distinguished *T. vulgare* from *T. durum* thus seems to be established as identical with one of the genoms in *Ae. cylindrica*.

A full study was made of the behaviour of the univalents. This was characterized by a more or less incomplete plate formation and division of the univalents occurring to a greater or less extent. The different hybrids are to a large extent characteristic in these respects. It is pointed out that the tendency of the univalents lying outside the equatorial plate not to divide brings about a reduction in the number of univalents.

The orientation of a univalent with regard to the equatorial plate was found to have more influence on its division or non-division than the actual distance from the plate.

A number of figures described by other authors as anaphase, as well as corresponding stages in his own material, are interpreted by the author as early metaphase. The fact that the bivalents go to the pole before the univalents has led to a certain amount of misinterpretation by Rosenberg in the *Hieracium* material.

The tendency to form an equatorial plate was greatest in the hybrids *Ae. cylindrica* x *T. durum* and *Ae. ovata* x emmer species, least in tri- and tetraploid *Triticum* hybrids, except for the pentaploid wheat hybrids where plate formation occurs never or very rarely. In the latter case all univalents usually divide.
The hybrid *Ae. cylindrica* x *T. vulgare* under certain conditions of fixation is unique among the hybrids investigated in that the univalents form a regular ring round the bivalents in the equatorial plate.
In some hybrids a certain variable number of bivalents in addition to the regular 7, together with a certain number of trivalents, indicate the existence of affinities between certain chromosomes of different genoms.
It is shewn that in an individual of the genom constitution AAB, if the AA pair reduce regularly and the 7 single chromosomes of the B genom are distributed at random, there will be certain cases when two gametes will meet in self-fertilization, each of which has 7 A + 7 B chromosomes ; this will result in a tetraploid plant of the constitution AABB.

504. **Stutzer, I. I.** **633.11:575.127.2**
(Interspecific crosses of spring wheats.)
Proc. U.S.S.R. Congr. Genet. Plant– and Animal–Breed. 1930 : **2** : 569–70.
Contrary to the usual opinion, the facility and fertility of crosses between species of different chromosome number was no less than in crosses within the species. There was no true dominance in interspecific crosses.
Vulgare forms with a certain number of characters from the other species emerged and constant races were quickly formed. In some crosses this occurred for a considerable number of characters and in others new constant forms differing from both parents or intermediate between them arose. Some of these new forms ranked as new species.

505. **Raum, H.** **633.11:575.127.2:581.46**
Ueber die Vererbung von Aehreneigenschaften bei Kreuzungen zwischen Emmer– und Dinkelreihe des Weizens.
(On the inheritance of ear characters in crosses between tetraploid and hexaploid wheats.)
Z. Züchtung 1931 : **A. 16** : 161–254.
16 crosses were made between the following varieties of tetraploid and hexaploid wheats : *T. turgidum dinurum, T. dicoccoides spontaneonigrum. T. dicoccoides Aaronsohni, T. dicoccum rufum, T. polonicum villosum, T. turgidum, T. durum, T. dicoccoides fulvovillosum* and *T. compactum creticum, T. Spelta, T. vulgare ferrugineum, T. vulgare erythrospermum* and other strains of *T. vulgare.*
A difference in the fertility of the hybrids was found according to whether wild forms or the " naked " wheats of the tetraploid group were crossed with the hexaploids. The former had 60–70 per cent. of fertile flowers, the latter 20–40 per cent. It is assumed that in the first case gametes with three to four excess chromosomes are sterile and in the second those with two to five excess chromosomes. The *dicoccoides–vulgare* hybrids and those of the reciprocal cross were found to be equally fertile. The fertility of the F_2 is on the whole less than that of F_1 except in the case of certain crosses, and F_3 is less fertile than F_2.
Four genes are assumed for density. The two lengthening genes L_1 and L_2 are here denoted as A and B, C is the compactum gene and L is another gene for length which occurred only in the tetraploid series. C was present in all the tetraploid series used, with the exception of *dicoccum* and *polonicum*, its presence is however disguised by the L gene. All the genes A, B, C and L of the hexaploid series lie in the chromosomes which pair with those of the tetraploid series.
The researches shew that the factor S for tight glumes is present in all wheats but in those with loose glumes its expression is inhibited by H5. This factor is present in one of the tetraploid chromosome groups or in the extra hexaploid group. In one *vulgare* variety it was found to be doubly present. A special feature of this glume character is the difference in the segregation ratios in reciprocal crosses. Speltoids occurred among the progeny of all the crosses except

in the crosses *T. durum* x Mauerner or Panzer wheats and in *T. polonicum* x *compactum*. In most cases the ratios of speltoids to normal plants failed to fit into Nilsson-Ehle's scheme, probably because of the unequal distribution in these cases of the univalent chromosomes.
Brittleness of the rachis is inherited in the same way as the character for light or loose glumes. The factor B for brittleness is present in all wheats, those with a tough rachis carrying an inhibiting factor Hb.
A new combination of loose glumes and brittle rachis occurred and was named *vulgoide*. From the cross *T. turgidum Fucense* x *T. vulgare*, Svalöf's Panzer wheat, there appeared not only speltoids and vulgoids but a true *dicoccum*. The combination of tight glumes and brittle rachis is especially frequent when *T. spontaneonigrum* is used.
The inheritance of awns involves besides two factors for awns, two inhibiting factors. One of these factors for awns, F, occurs throughout the emmer group together with (except in *polonicum*) one of the two inhibiting factors H which however cannot be expressed without the presence of the other. The other factor for awns, G, is found in all the hexaploid wheats except *Spelta*. Both inhibiting factors are present if the variety in this group is unawned. It is possible that both F and G are sometimes present in some of the awned hexaploid wheats. The factors for awns are not situated in the univalent chromosomes.

506. **Levitsky, G. A., and Benetzkaia, G. K.** **633.11:575.129**
633.14:575.129
(Cytological investigation of constant intermediate rye-wheat hybrids.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 345–52.
Constant intermediate fertile hybrids of wheat and rye have proved to have 56 chromosomes, or the sum of the diploid numbers of the two parents.
Various irregularities of division frequently occur however ; these are described and figured ; they result in certain irregularities in the pollen grains.
It appears that only gametes bearing the normal chromosome number enter into fertilization and the somatic number is always 56. Frequent cases of absence of pairing were observed, for which various explanations are suggested.
The amphidiploid condition is thought to have arisen by apogamous development of the ovule in the F_1 hybrid.

507. **Delaunay, L. N.** **633.11:575.243:537.531**
(Essay of an experimental obtainment of hereditary variations in wheat through the roentgenization of the young ears.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 229–30.
Doses such as Muller used produced varying amounts of sterility when applied to wheat. The sterility was very great when treatment was applied to ears which had not begun the reduction division, less with ears just beginning the reduction division and great again for later stages reaching a maximum at the time of flowering.
The length of the dose did not seem to influence the degree of sterility. The sterility frequently results from disorganization of the tissue rather than gene changes. Further experiments are being started using weaker doses.

508. **Delaunay, L. N.** **633.11:575.243:537.531**
Resultate eines dreijährigen Röntgenversuchs mit Weizen.
(Results of a three-year Röntgen-ray experiment with wheat).
Der Züchter, 1931 . **3** : 129–37.
The newly-formed ears of a white-eared, white-grained, awnless wheat with pubescent leaves, *T. vulgare albidum* were exposed to the following dosage, 50 k V, 5 m A, at 25 cm. from the antikathode, with an aluminium filter 1 mm. thick for one to three hours. This length of time was found to cause such sterility that it was reduced to a minimum of half an hour in 1928 and to seven and a half minutes in 1930. It was found that the amount of sterilization increased the later the treatment was applied.

Only pure line material was used and all possible precautions were taken to prevent cross-fertilization.
A cytological investigation of the root-tips was undertaken for all F_1 plants and of all aberrant F_2 plants. Among the 202 F_1 plants 13 mutations appeared.

(1) Heterozygous speltoid plants—these segregated in F_2 into normal, heterozygous or homozygous speltoids in the ratio 25 : 25·5 : 1·5. The homozygous plants were awned.
(2) An awned plant, segregating in F_2 into 56 awnless, 110 heterozygous and 58 awned. Short awns were present on the outer glumes, in the homozygous awned plants only, due, it is assumed, also to the presence of the recessive gene (n) for awns. This is regarded as a case of a factor mutation.
(3) A poorly developed plant with only 41 chromosomes + a small fragment. The four F_2 plants that resulted all differed from the normal and from the F_1 plant. In one of these the chromosome fragment was still present but had increased in size.
(4) A complex speltoid-agropiroid mutation, resembling the other speltoids but with narrower ears, reduced fertility and two chromosomes shorter than the rest. There were a number of different types in F_2 which need fuller investigation.

The other F_1 mutations that are briefly described were plants with squarehead-like ears ; plants with 45 chromosomes, 43 of them long, one shorter and one roundish fragment ; sterile plants ; plants with 41 chromosomes ; dwarf plants and plants with branched ears.

509. **Woodworth, C. M.** **633.11–1.557:575.1**
Breeding for yield in crop plants.
J. Amer. Soc. Agron. 1931 : **23** : 388–95.

It is pointed out in this paper that the present methods of breeding for yield depend too much on chance and that too little is known of the various component parts that make up yield, their relation to one another and their genetical behaviour. It is urged that the attributes of yield in each strain should be fully analysed before breeding for yield is undertaken.

510. **Briggs, F. N.** **633.11–2.451.3 -1.521.6:575.11**
Inheritance of resistance to bunt, *Tilletia tritici*, in hybrids of White Federation and Banner Berkeley wheats.
J. Agric. Res. 1931 : **42** : 307–13.

The F_2 of crosses White Federation x Banner Berkeley and Martin x White Federation contained rather less than 25 per cent of infected plants, indicating the presence of a single dominant factor for resistance. The F_2 of Martin x Banner Berkeley contained no bunted plants, shewing that the resistance factor was the same in both parents.
An examination of the F_3 made it possible to separate the heterozygous families from the homozygous, whereby clear 1 : 2 : 1 ratios were obtained. These were verified in the F_4.

511. **Quisenberry, K. S.** **633.11–2.452–1.521.6:575**
633.11–2.111:575"793"
633.11:575.11
Inheritance of winter hardiness, growth habit and stem-rust reaction in crosses between Minhardi winter and H–44 spring wheats.
Tech. Bull. U.S. Dept. Agric. 1931 : **218** : 45 pp.

The material for the study of winter hardiness in the open was grown in two different districts, laboratory tests were also made. There was a prevalence of the non-hardy type and the genetical analysis indicated the presence of several factors but external conditions greatly influenced their effect. The agreement between the results of laboratory tests and the results in the field was fairly good.
There was a correlation, though not a complete one, between growth habit and hardiness.
F_3 data for rust resistance did not bear out the one factor difference indicated by the F_2 but modifying factors must be also assumed.

Differences were observed in rust reactions between the lines when sown in the autumn and the same lines sown in the spring.
The reaction to the physiological forms of stem rust 60 and 36 was the same.
There was no close relation between the rust reaction of seedlings tested in the greenhouse and that of the mature plants in the field.
The hybrids started heading before the winter parent.
Two duplicate factors are assumed for the production of purple colour in the coleoptile.
In this cross the awnless or awnleted character is partially dominant in a one factor inheritance.

512. **Boeuf, F., Matweeff, M., and Seguela, I.** **633.11:664.641.016**
Valeur boulangère des blés tendres cultivés en Tunisie.
(Baking value of soft wheats cultivated in Tunisia.)
C. R. Acad. Agric. Fr. 1931 : **17** : 108–14.
The baking quality judged by the Chopin extensimeter is given for a number of varieties already in cultivation, certain hybrids which are beginning to be cultivated, other hybrids under trial and Manitoba as control. All had a baking quality of the first order.

513. **Emme, H.** **633.13:575**
Genetik des Hafers.
(Genetics of oats)
Der Züchter 1931 : **3** : 109–24.
This is a review of the literature on the genetics of oats up to and including 1930. There are short notes on the results of experiments on the inheritance of morphological and physiological characters, on linkage, crossing between the groups with different chromosome numbers, natural crossing and mutations.
A cross between a strain of *A. abyssinica* var. *glaberrima Chiovende* x *A. sativa* var. *iranica* Vav., both 100 per cent awned, gave an F_1 of completely awnless plants. Details of these results will be published soon. The bibliography contains references to 213 papers.

514. **Ivanov, F. J.** * **633.13:575.127.2**
[On crosses of tetraploid oat forms. (*Av. barbata* Poll., *Av. Brauni* Körn.) among themselves and with hexaploid forms (*Av. sativa* L., *Av. nuda* L. var. *inermis* Körn., *Av. Ludowiciana* Dur., *Av. sterilis* L.)]
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 243–63.
In a number of crosses of tetraploid x hexaploid species and of tetraploids amongst themselves, the number of successful pollinations was determined. This was such a variable character, even in crosses within a species, that it was useless as a criterion of affinity. Similarly with germination. The best criterion proved to be the degree of fertility of the F_1.
A. Brauni gave low degrees of fertility when crossed with tetraploid species and almost complete sterility with hexaploid forms. It therefore appears to be very remote from the hexaploid forms.
Allelomorphism has been established amongst genes in all the hexaploid species and in some cases allelomorphism also exists between genes in hexaploid and tetraploid species. A series of multiple allelomorphs involving specific character complexes has been established between *A. sativa* types, *A. sterilis* types and *A. fatua* types, the *A. fatua* types being recessive and *A. sativa* dominant.
A. Brauni however proves to be lacking in these homologues and in its crosses the wild type dominates.
These complexes of specific characters were in several cases broken down, shewing that more than one gene is involved. That they are closely adjacent in the chromosomes is indicated by

* **A full translation of this paper is filed at the Bureau.**

the fact that somatic mutations usually involved all the genes. Somatic mutations occurred rather frequently in crosses involving different chromosome numbers.
Fatuoid mutations are regarded as chromosome aberrations and the fatuoids are shewn to be quite distinct from *A. fatua.*
Particular genes for pubescence in the second, third, fourth and fifth grains of *A. fatua* exist. They are all recessive and each acts only in the presence of genes for pubescence in all preceding grains.

515. **Builin, D.** **633.13:581.162.32**
633.13:575.242

(On cross-pollination of oats under the conditions of the Trans-Volga steppe region.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed., 1930 : **2** : 173–79.

Oats which are completely cleistogamous under northern conditions of growth proved capable of a considerable degree of cross-pollination in more southern regions.
The few cases reported by previous authors give no idea of the actual frequency of the phenomenon, since only those cases would be observed in which the parents differed in some distinctive feature.
Certain plants were found in 1926 whose awns clearly resembled *A. fatua.* Seeds were sown and the progeny shewed segregation into normal, intermediate and *fatua* types with regard to awn, the remaining characters being all like the normal type. These three types appeared in the ratio 1 : 21 : 8. In the following generation seven plants of the *fatua* type and two of the normal bred true, 21 of the intermediate type again segregated. The deficiency of the *fatua* types is explained by their lower power of growth.
Such types have also been found in other cultures. Also types with hairy paleae ; these bred true and are referred to the type *transiens* Hausskn ; they occurred in a number of cultures, involving different botanical types.
A plant was found whose progeny shewed segregation into four panicle types with indications of a dihybrid ratio, which can also, however, be interpreted as a monohybrid.
The author is inclined to regard these phenomena as the result of natural cross-pollination rather than mutations.

516. **Leith, B. D. and Shands, R. G.** **633.13:581.46.061.5:575.1**

The production of an economic strain of white barbless barley.
J. Amer. Soc. Agron. 1931 : **23** : 396–401.

A pure line selection of Oderbrucker, *Hordeum vulgare pallidum typica* Kcke-Harlan was crossed with the smooth awned black barley *H. vulgare nigrum leiorrynchum* Kcke-Harlan. Among the hybrids, strains were selected with white grain, awns as barbless as the smooth parent, very resistant to *Helminthosporium gramineum* and with higher yield than the Oderbrucker parent. The valuable strains were slightly later in maturing and there was apparently linkage between short basal internodes and short heads.

517. **Welton, F. A., and Morris, V. H.** **633.13–2.183**
633.11–2.183

Lodging in oats and wheat.
Bull. Ohio Agric. Expt. Sta. 1931 : 471 : 88 p.

The experiments were designed to investigate the effect of various conditions on the internal make-up of the plant and its subsequent response to lodging. Vegetative growth, measured as percentage of straw was greater in the lodged than in the unlodged sheaves.
Shading, high temperatures and rich soil reduced the amounts of carbohydrates and favoured lodging.

Among varieties, those with weak-straw had a higher number of culms per plant and less dry matter and total carbohydrates per unit length of culm.
The hypodermal tissue was more extensive and the cell walls thicker in the stiff-strawed varieties and narrower and with thinner walls when subjected to conditions favourable to lodging.
Normal-sized seeds and thin sowing were conducive to standing.
The relation of various cultural methods to lodging is discussed and a bibliography of 61 titles is appended.

518. **Nicolaisen, W.** **633.13–2.451.2–1.521.6:575.11**
633.13–2.451.2:576.16
Beitrag zur Immunitätszüchtung des Hafers gegen *Ustilago avenae* (Pers.) Jens.
(Contribution to the breeding of oats immune from *U. avenae* (Pers.) Jens.)
Z. Züchtung 1931 : A. **16** : 255–78.
The infection method is discussed in some detail.
The author concludes that no species consists entirely of immune or susceptible varieties, each species contains both.
A large number of varieties was tested. All the local varieties were more or less susceptible. None of the foreign immune varieties gave good enough yields to be taken into cultivation but some were very promising as parents.
Four susceptible varieties were crossed with the immune variety Black Mesdag. In each case both the two parents were varieties of *A. sativa* and resistance proved to be dependent on a single dominant factor. Another cross of von Lochows Yellow x Black Mesdag was examined in detail in the F_2 and F_3. Both parents again belonged to *A. sativa*. Segregation occurred in F_2, giving immune forms and forms more susceptible than the more susceptible parent. The ratios seem to indicate that Black Mesdag contains two dominant immunity factors, inherited independently. The other parent, which was resistant but not immune contained a third factor, different from either of the other two. This accounted for the appearance of fully susceptible forms in F_2.
An immune variety of *A. byzantina* was crossed with a very susceptible *A. sativa*. Examination of a very large F_3 shewed that the immune parent contained two immunity factors, independently inherited, and either of which alone produced immunity.
This variety was also crossed with the original Lochows Yellow, whose one immunity factor also proved to be different from the two in the *A. byzantina*.
From a cross involving Lochows Yellow and Fulghum, a somewhat susceptible variety of *A. byzantina*, both fully immune and fully susceptible segregates arose.
Cultures of the fungus collected in a number of different parts of Germany and certain other countries were tested on five differential hosts. The existence of various physiologic forms of the fungus was established ; it was seen that the most virulent forms are confined to a very limited region of Germany.
Black Mesdag remained immune to all forms.

519. **Schribaux.** **633.14**
L'amélioration du seigle.
(Rye improvement.)
C. R. Acad. Agric. Fr. 1931 : **17** : 561–92.
A mixture of equal parts of local rye and Petkus rye has been grown and the seeds, largely resulting from natural crossing, grown and so on. An increase in yield of fifteen per cent. has resulted, the hybrid population being judged superior to either parent.

520. **Czarnocka, J.** **633.14(43.8)**
Przyczynek de poznania gatunku *Secale cereale* L. i niektórych jego odmian krajowych.
(Contribution to the study of the species *Secale cereale* L. and certain Polish varieties of this grain)
Mem. Inst. Polon. Ec. Rur. 1930 : **11** : 70–110.
An account of a number of rye varieties and hybrids grown in Poland, two of which are very early and of higher quality, yield and protein content than later types.

521. **Kulkarni, C. G.** **633.15:575.061.6:581.48**
Inheritance studies of white-capping in yellow dent maize. II.
Pap. Mich. Acad. Sci. 1931 : **13** : 111–29.
The factor for white-capping has been shewn to be a simple dominant inhibitor, only manifested in the presence of yellow. The different F_2 plants from the cross of parents differing in both these factors were selfed and the results are reported in this paper. Both F_3 and F_4 results conformed to expectation on the above interpretation.
Identical results were obtained with other varieties carrying a factor for white-capping and intercrossing of these shews that the factor is the same in each case.
White-capping also proved to be dominant to dominant white endosperm and to yellow flint. The character was not linked with any of the fourteen characters for which linkage relations were examined.

522. **Beadle, G. W.** **633.15:575:11:576.356**
A gene in maize for supernumerary cell divisions following meiosis.
Mem. Cornell Agric. Expt. Sta. 1931 : **135** : 12 pp.
A gene is described which causes a series of supernumerary divisions of a meiotic character at the time of microsporogenesis. The number of chromosomes in the cells is thus much reduced and the plants are male sterile and also largely female sterile. The gene behaves as a unit recessive and has been located in the $Y–P_1$ linkage group, close to Y ; it was not possible to determine the order of these three genes. It proved not to be allelomorphic with the asynaptic gene *as*.

523. **Mangelsdorf, P. C. and Fraps, G. S.** **633.15:575.11.061.6:577.16**
A direct quantitative relationship between vitamin A in corn and the number of genes for yellow pigmentation.
Science, 1931 : **73** : 241–42.
The triploid nature of the endosperm affords a means of producing 4 classes of seed differing in the proportion of dominant and recessive genes for yellow pigmentation, i.e. classes having 0–3 Y genes. By appropriate pollinations these 4 types were created and their relative vitamin content tested. In both 1928 and 1929 there was almost complete association between colour and vitamin A content, the white grains being entirely lacking and each gene producing approximately 2·5 units of vitamin A per gramme of seed.
This direct quantitative behaviour points to the fact that the gene acts in some way other than an enzyme.

524. **Anderson, E. G., and Emerson, R. A.** **633.15:575.116.1**
Inheritance and linkage relations of chocolate pericarp in maize.
Amer. Nat. 1931 : **65** : 253–57.
Chocolate pericarp is a simple dominant to colourless, the gene producing also chocolate colour in the cob. A summary of linkage tests involving all known linkage groups is given in tabular form. No linkage was evident with any of the nine linkage groups. It is therefore possibly a representative of the tenth linkage group.

525. **Haber, E. S.** **633.15:575.12:575.22**
Uniformity of maturity and size of ears of hybrid sweet corn compared with commercial strains.
Proc. Amer. Soc. Hort. Sci. 1930 : 352–55.
Uniformity of maturity is of prime importance for canning. The probable error and co-efficient of variation for size of ear and maturity proved to be lower for hybrid strains than for any of the commercial strains used in the comparison.

526. **Hayes, H. K., Brewbaker, H. E., and Immer, F. R.** **633.15:575.125**
Double-crossed corn in Minnesota.
Bull. Minn. Agric. Expt. Sta. 1930 : **260** : 16pp.
The double-cross system and its advantages are explained and results are given to shew that extremely valuable seed material can be obtained in this way.

527. **Rhoades. M. M.** **633.15:575.182**
Cytoplasmic inheritance of male sterility in Zea mays.
Science 1931 : **73** : 340–41.
A note on the investigations of the inheritance of male sterility in maize, made by R. A. Emerson and F. D. Richey at Arequipa, Peru.

528. **Vasserman, I. S.** **633.15:575.242:581.44**
(Materials for the study of brachytic mutation in maize.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : p. 197.
In the progeny of certain brachytic plants one sixteenth of the individuals were of a new type, called brachytoid, intermediate between normal and the true brachytic type.

529. **Mumm, W. J. and Woodworth, C. M.** **633.15:575.242.061.5:581.48**
Heritable characters in maize. XXXVI. A factor for soft starch in Dent Corn.
J. Hered. 1930 : **21** : 503–06.
A type with starchy endosperm has appeared amongst a horny strain resistant to scutellum rot. In all other characters it is identical and is supposed to have arisen by mutation. The character is completely recessive to horny.

530. **Jones, D. F.** **633.15:577.84**
Dioecious maize.
Science 1931 : **73** : p. 432.
Two genes are known, one causing failure of the silk and another which turns the tassel into a seed-bearing structure, giving in the one case an entirely male and the other a female plant. Hybrids between such plants are hermaphrodite, segregation occurring in F_2. Other crosses shewed that double recessives were similar to the single recessive plants in which the tassel bears seeds. Such a plant when crossed with silkless gives all silkless (male) progeny, and with a plant of its own constitution all female. Dioecy has thus been established.

531. **McClintock, B.** **633.15:581.162.5:576.356**
A cytological demonstration of the location of an interchange between two non-homologous chromosomes of *Zea mays*.
Proc. Nat. Acad. Sci. Wash. 1930 : **16** : 791–96.
Examination was made of a strain characterized by segmental interchange, which resulted in a ring of four chromosomes and consequent sterility in fifty per cent. of the progeny. Each of the chromosomes concerned could be distinguished by the nature of the spindle fibre attachment. The interchange was found to be unequal. Chromosomes possessing homologous spindle fibre attachments may go to the same pole, causing sterility, or to opposite poles, resulting in fertility. It is assumed that this happens equally frequently, resulting in the fifty per cent. sterility observed.

532. **Wirth, C.** **633.16:575(48.5)**
Die schwedische Braugerste, ihre Anbau, ihre Veredelung und ihre Brauwert. (The Swedish malting barleys, their cultivation, improvement and malting value.)
Wschr. Brau. 1930 : **47** : 483–86, 495–98, 505–08.
Contains a very brief description of the Svalöf methods and the varieties produced.

533. 633.16:575(77.5)
633.11:575(77.5)

The plant breeder contributes to a better agriculture.
A Year's Service of Res. in Lab., Barn and Field. Bull Wisc. Agric. Expt. Sta. 1931 : **420** : 37–38.

A new barley outyielding earlier varieties, resistant to stripe, and barbless, is described. Also Progress, a new spring wheat, resistant to *Fusarium* and more rust resistant than Marquis ; very considerably higher in yield.

534. **Peitel, M. J.** 633.16:576.16:581.162.32

(On the origin of new forms of barley by means of natural crossing.)
Proc. U.S.S.R. Congr. Genet., Plant- and Animal-Breed. 1930 : **2** : 381-91.

The barleys of the Daghestan region exhibit extreme polymorphism and variation, each variety consisting of innumerable distinct races. Various new types discovered are enumerated and described.
The naked barleys shewed much less variation, differences being observed only in colour and size of grain.
The percentage of natural crossing between easily distinguished forms amounted to 0·19 per cent., so that the total percentage of crossing must be much higher than this.
The segregation of a number of these for certain ear characters is tabulated and the probable parental species noted.
In the progeny of a natural cross in a naked type, naked forms with spreading and adpressed empty glumes and hulled types with spreading and adpressed glumes appeared, although the former type of glume is characteristic of the naked oats and the latter of the hulled (*nutans*) oats. The latter type was a simple dominant.
Constant hybrid forms were also found, differing in the fertility characters of the lateral spikelets. Certain types combined the long spikelet rachilla characteristic of the two-rowed barleys with all grades of fertility and awning, indicating crossing of two-rowed with six-rowed species.
Albinos also occurred.
Natural crossing is regarded as the cause of this great variation and as a potent factor in the evolution of new forms.

535. **Emme, E. K.** 633.16:576.312.32

(Karyosystematical investigation of the section *Eu-Avena* Griseb.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 585–86.

Amongst a very large number of varieties of the section examined, none was found with chromosome numbers other than 7/14, 14/28 or 21/42. The species *A. hirtula* Lag., *A. strigosa* Schreb., *A. brevis* Roth. and *A. nudibrevis* Vav. are nearly related on cytological, morphological and geographical grounds. The variety *A. barbata* said to have 7/14 chromosomes is thought to be a form of *A. strigosa*.
It is pointed out that *A. Wiestii* has been reported with 14 and 28 somatic chromosomes and that there must be some systematic uncertainty involved.
The position and numbers of other species is given. Preliminary experiments indicate the existence of clear morphological differences between the chromosomes of the different groups.

536. **Kasiwada, S.** 633.16:581.141:575.11

Ueber Klebs- und Stärkegerste und ihre Erblichkeit.
(On glutinous and starchy barley and its inheritance.)
Proc. Crop Sci. Soc. Japan 1930 : **2** : 193–94.

Two varieties of glutinous barley are known. Both are hull-less and four-rowed, one is purple coloured all over, the other only in the glumes. The nature of the endosperm can only be detected by treatment with iodine. The starchy and glutinous pollen grains of the F_1 are as 1 : 1. In F_2 starchy, glutinous and mixed occur in the ratio 1 : 1 : 2.

537. **Robertson, D. W., and Deming, G. W.** **633.16:581.162.32**
Natural crossing in barley at Fort Collins, Colorado.
J. Amer. Soc. Agron. 1931 : **23** : 402–06.

The natural crossing observed between the six varieties of barley tested, varied more according to the variety than according to the season. *H. deficiens nudideficiens* shewed up to 20·708 per cent. but the other varieties used all shewed less than 0·15 per cent.

538. **Johnston, C. O., and Mains, E. B.** **633.17–2.452–1.521.6**
Relative susceptibility of varieties of sorghum to rust, *Puccinia purpurea*.
Phytopathology, 1931 : **21** : 525–43.

Observations on the relative resistance to sorghum rust of a large number of varieties, hybrids and selections of sorghums were made in Kansas during the three years 1927-29. There were marked differences in reaction and on the whole it was found that the kafirs and sorgos were moderately susceptible, the feteritas very susceptible and the milos very resistant ; resistant and susceptible varieties were found in the kaoliang, broomcorn and other groups. The resistance of the hybrids depended on their parentage.
A large number of other varieties were tested in the seedling stage only.
The purple colouration appeared to be due not to the fungus but to presence of factors for the development of colour in the varieties.
An attempt was made to infect varieties of corn with *P. purpurea* but without success and sorghum varieties were found to be immune to *P. sorghi*.

539. **Hisamune, T.** **633.18:575.061.633**
Ueber das Zahlenverhältnis der aus den perennierenden weissgestreiften Reissippe (" Shimaine ") entstehenden weissen, grünen und weissgestreiften Nachkommen.
(On the numerical relations of the white, green and striped progeny originating from the perennial white striped rice variety (" Shimaine "))
Nôgyô Kenkyû (Z. landw. Studien) 1930 : **15** : 290–300.

The perennial plants of the three groups continued to produce only their own kind.

540 **Sampietro, G.** **633.18:575–181.13:581.162.5**
633.18:581.162.32
Sterilità di un ibrido artificiale ed anomalia di un ibrido naturale.
(The sterility of an artificial hybrid and an anomaly in a natural hybrid.)
Giorn. Risicolt. 1931 : **21** : 17–21.

A completely sterile dwarf plant is described which was found among the F_2 of a cross between Americano ♀ x Lady Wright ♂. The reproductive organs appeared perfectly normal and the grain remained alive and turgid for some time, then shrivelled up.
The other hybrid was in all probability derived from a natural cross between Chinese Originario and Bertone, for in a single panicle of which the grains were mostly of the Chinese Originario type, were found others of the Bertone type.

541. **Selim, A. G.** **633.18:576.3**
A cytological study of *Oryza sativa* L.
Cytologia, 1930 : **2** : 1–26.
Meiosis was studied in the pollen-mother-cells of five races of *Oryza sativa*. In each case the haploid chromosome number was 12 but the races could be grouped according to the number, one or two, and behaviour of their nucleoli.
It is suggested that where division of the nucleoli took place, the primary one contributed to the formation of the spindle and the secondary to chromosome formation.

542. **Hisamune, T.** **633.18:581.162.5**
Ueber das Zahlenverhältnis der sterilen Körner an den dauernd perennierenden sterilen Reissippen und der sterilen Stöcke in den nachfolgenden Generationen.
(On the numerical relations of the sterile grains in the perennial sterile rice strains of the sterile tillers in the subsequent generations.)
Nôgyô Kenkyû (Z. landw. Studien) 1930 : **15** : 273–89.
The tillers with the fertile and sterile panicles described by Kondô were allowed to grow on into perennial plants and it was found that both continued to produce fertile and sterile panicles respectively although a few sterile grains were occasionally found in the fertile panicles and vice versa.

543. **Kato, S., and Kosaka, H. et al.** **633.18:581.162.5:576.16**
(On the affinity of the cultivated varieties of rice plants, *Oryza sativa* L.)
J. Dept. Agric. Kyushu 1930 : **2** : 241–76.
Two types occur among cultivated varieties, Japonica and Indica, which are fully fertile within each type but are less fertile when the types are crossed, due to a large percentage of imperfect pollen grains.

544. **Noguchi, Y.** **633.18:581.331.23.02**
Studien über den Einfluss der Aussenbedingungen auf das Aufblühen der Reispflanzen. II. Pollenkeimung und Pollenschlauchwachstum.
(Studies on the influence of external conditions on the flowering of riceplants. II. Pollen germination and pollen-tube growth.)
Jap. J. Bot. 1931 : **5** : 351-69.
The effects of temperature, moisture and light were studied. It was found that the best results were obtained when the pollen was allowed to germinate on the stigma. The experiments with temperature showed that there was development of the pollen tubes between 20-40° C., about 30° C being the optimum. The comparative effects of saturated, dry and normal air showed that the two former have an unfavourable effect on germination and on pollen-tube development. Light, compared with darkness, slightly accelerated pollen germination but did not affect pollen tube growth.

545. **Sengbusch, R.** **633.367:575:581.192**
Bitterstoffarme Lupinen II.
(Lupins with low alkaloid content)
Der Züchter 1931 : **3** : 93–109.
Large numbers of lupins from widely different sources belonging to different species were examined and a certain number of sweet lupins was selected. These are being propagated.
The methods of estimation are described in detail.
The three best strains of *L. luteus* contained less than 0·03 per cent total alkaloid, compared with 0·51 per cent for normal lupins. This low alkaloid content was characteristic also of the progeny

and is thus hereditary. Certain strains of *L. angustifolius* were isolated in which the seeds had 0·01 per cent total alkaloid and the leaves only 20 per cent of this, being consequently free from bitterness both in seed and leaves. Percentages are considerably below those for normal lupins from which the bitter principle has been artificially removed. Guinea-pigs when fed with the new strains gained in weight, in contrast with a diet of ordinary lupins under which they died in three weeks. Preliminary experiments shewed them also to contain less poisonous principles. It seems probable that such alkaloid-free strains of various plants will have a considerable value as crop plants.

546. **Knapp, O.** **633.367:575.22**
Lupinus albus. Eine historische, sowie botanisch-variationsstatistische Studie.
(*Lupinus albus.* A history, as well as a study in botanical variation statistics.)
Z. Züchtung 1931 : **A. 16 : 279-335.**

The author traces the history of the occurrence and cultivation of the lupin from its earliest mention in the literature of Greece.
The variation studies were made on nineteen characters and these showed a large range of fluctuation. Positive correlations were found between plant weight and the following : total seed yield, total seed number, 100 seed weight and plant length. The plants tested did not belong to a pure line.

547. **Harechko-Savizkaja, E.** **633.41:581.162.52**
(Flowering, fertilization and different types of sterility in *Beta vulgaris* L.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2 :** 539–49.

Flowering proceeds normally even after removal of the male or female organs.
The biology of flowering is described. The period of activity of the stigma is seventeen days at the beginning of the flowering season, increasing to 24 days at the end. The egg cell is ready for fertilization five days before flowering. Fertilization occurs nineteen to 24 hours after flowering.
Self-sterility results from the feeble growth of the pollen tubes and the death of the zygote.
Races of sugar beet differ in degree of compatibility.
The sterility of the gametes depends on the degeneration of the nucleus of the pollen grains in the one case and the embryo sac in the other.

548. **Fukushima, E.** **633.42:576.356.5**
Formation of diploid and tetraploid gametes in *Brassica.*
Jap. J. Bot. 1931 : **5 :** 273–83.

Diploid, tetraploid and octoploid pollen grains were observed in two plants of *Brassica japonica.* They occurred in groups, most frequently of 2–8 cells, as if derived from a single polyploid archesporial cell. Their divisions were regular, as a rule only bivalents were formed. There is a definite relation between chromosome number and cell size. It is suggested that such polyploid pollen cells may be one method in the production of polyploidy in the genus.

549. **Sirks, M. J.** **633.491:575.19**
La signification d'une recherche sur l'orgine de nos races de pommes de terre.
(The importance of a research into the origin of our potato varieties.)
Bull. Assoc. Int. Sélect. Plantes 1931 : **4 :** 50–54.

The author doubts whether a genetic analysis of the potato will bring any immediate practical results. The method of " diallel crosses " described by Johs. Schmidt, involving a comparison of the progeny of various combinations of parents with a view to deciding upon the best, is thought

to have possibilities for the future. The most profitable study is thought to be that of the parentage of successful varieties, with a view to determining those sorts which have played the greatest parts as parents. It is suggested that such tables should be made by each country, the whole being part of an international scheme.

550. **Arts, T.** **633.491:576.16**
Verwantschapsgroepen bij de aardappelrassen.
(Groups of related forms in potato varieties.)
Landbouwk. Tijdschr. Groningen 1930 : **42** : 494–511.

The predominance of the three varieties, Early Rose, Diest's Daber and Paterson's Victoria in the parentage of present day potato varieties is pointed out. Of 750 varieties, all could be arranged in eighteen family groups. The author recommends further hybridization with the local land races, followed by the isolation of lines homozygous for certain qualities.

551. **Bleier, H.** **633.491:581.162.5:576.356**
Untersuchungen über die Sterilität der Kartoffel.
(Investigations on the sterility of the potato.)
Arch. Pflanzenbau, 1931 : **5** : 545–60.

The findings of previous authors are discussed.
The exact determination of the chromosome number in the reduction division was very difficult. Most of the varieties examined had 24 but some preparations shewed more, others less. Even in normal varieties the reduction division is extremely complicated. Only one variety was found which shewed no irregularities in any of the cells. At varying stages of development in other varieties a degeneration of the cells may set in, chromosomes may separate from the spindle and form micronuclei, or the chromosomes may arrange themselves irregularly on spindle formation, so that no regular homeotypic division can take place and 3, 4 or more nuclei may be formed. Certain cases where all 48 chromosomes appear on one spindle might give the appearance that this was the diploid number. Pollen grains with double chromosome number result. Dyads may be formed instead of tetrads by the formation of restitution nuclei or the union of two adjacent homeotypic metaphases.
The extent of irregularity varies in different varieties, whose behaviour is described. The irregularities varied also with the stage of development of the plant but very little with temperature.
Various misinterpretations of previous authors are pointed out and the author disagrees with the conclusions of Stow as to the direct effect of temperature on the reduction division.
The author considers all these disturbances to be occasioned by the same agency which brings about sterility and whose action may be influenced by temperature. The disturbing agency is thought to be some physiological condition in the plant itself.
These cytological irregularities are regarded as sufficient to account for abnormalities of segregation in genetical studies.

552 **Rathlef, H. von** **633.491:581.331.2**
Materialien zur Kenntnis des reifen Pollenkornes der Kartoffel.
(Material towards the knowledge of the mature pollen grain of the potato.)
Arch. Pflanzenbau 1931 : **5** : 486–544.

Microscopic observations were made on pollen grains treated with methyl green in acetic acid. The character of the pollen of the individual pollen grains is tabulated and described and a key given for separating the different pollen types, based on shape, size, nature of membrane, colour, nature of protoplasmic contents. Indications are given of the viability of each type.

The potato varieties which furnish pollen grains of the different types are indicated and a second key is given in which the varieties are separated according to the amount of each pollen type and the total quantity of pollen.
This method affords a means of judging the pollen fertility at any given time. Crosses are likely to succeed only in cool, moist weather.
The pollen characteristics are described in some detail for each variety.
Certain varieties, and groups of varieties of similar origin, were characterized by low pollen fertility.

553. **Semsroth, H.** **633.491–2.412.5–1.521.6(43)**
Die Abstammung der deutschen krebsfesten Kartoffelsorten.
(The origin of the German wart resistant potato varieties.)
Fortschr. landw. 1931 : **6** : 195–97.

Of the 72 resistant varieties entered in 1930 the ancestry was known for 54 only. It is seen that Richter's Jubel has played the most important part as a parent for resistant varieties. The parts played by other parents in the history of resistant varieties is discussed and tabulated. The 3 varieties which have produced most wart resistant varieties have also produced most scab resistant varieties.

554. **Miller, J. C.** **633.492:575.247**
A study of mutations of the Porto Rico sweet potato.
Proc. Amer. Soc. Hort. Sci. 1930 : 343–46.

The following types of mutation have been observed : white skin, white flesh, white skin and flesh, white striped, gold skin, purple skin and vineless bunch.
Certain of the mutant types differed from the parental form in flavour and in chemical composition and it is thought that differences in yield may be found, giving opportunity for improvement by selection.

555. **Varuntsjan, I.** **633.51:575(47)**
(New problems in cotton breeding)
Khlopkovoe Djelo (Cotton Industry).
1930 : **9** : 1026–33.

One of the new problems which confront the breeder is the production of wilt resistant forms. Tests with this end in view have been started. Another essential is drought resistance so as to extend the area of cultivation. Preliminary tests have indicated that late ripening varieties are more drought resistant than the early ones commonly grown under irrigated conditions.

556. **Harrison, G. J.** **633.51:575.182**
Metaxenia in cotton.
J. Agric. Res. 1931 : **42** : 521–44.

To test for the occurrence of metaxenia in cotton, the pollen of Pima Egyptian and Hopi plants was used to pollinate Durango upland cotton, a type intermediate to the male parents in several characters.
When Pima pollen was used the length of the boll period showed a significant increase and lint length was also increased. With Hopi pollen the lint length of the Durango variety was shortened. As neither of these showed correlation with other characters the phenomenon is attributed to metaxenia.

A reduction in the fuzziness of the seeds occurred when Hopi pollen (nearly naked seeds) was used on Pima plants (fuzzy seeds).
Similar effects were observed with Pima and Acala varieties.
It is pointed out that cross-fertilization may thereby produce immediate undesirable variations in certain characters and should be avoided if possible.

557. **Bel-Kuznjetcova, V.** **633.51:575.243**
(Work on artificially induced mutations in cotton in the plant breeding division of the N.I.Kh.I.)
Bull. Sci. Res. Cott. Inst. Tashkent 1930 : **5** : 18–21.

A very brief discussion of induced mutations and their value in plant breeding. The fact that this affords a means of creating new characters rather than recombinations of old ones led the division to undertake experiments with X-rays, radium, low temperature and narcotics, on cotton seeds and flowers.
The following investigations are in progress at the station :—

1. The influence of various agencies, of which there are 47 variants under investigation on the dry cotton seed.
2. The same with swelling seeds.
3. On seeds of 7 commercial varieties.
4. On germinating seeds previously soaked in salts of lead and iron. 59 different variants. The importance of such activators has been established.
5. X-ray treatment of 32 lines representative of different botanical groups. 64 variants.

The action of the various agencies on the flowers in various stages of development is being also examined.
The cotton plant displays a greater tolerance of these agencies than many plants.

558. **O'Kelly, J. F. and Hull, W. W.** **633.51:677.21:575**
Cotton inheritance studies : lint percentage.
Tech. Bull. Miss. Agric. Expt. Sta. 1930 : **18** : 15 pp.

High percentage of lint was dominant in a one factor inheritance.

559. **Ligon, L. L.** **633.51.0014–1.421**
Size of plat and number of replications in field experiments with cotton.
J. Amer. Soc. Agron. 1930 : **22** : 689-99.

560. **Saillard, E.** **633.63:581.192:575.42**
La fixité de la composition des végétaux, d'après Liebig, et la betterave à sucre née de sélections.
(The constancy of the composition of plants, according to Liebig, and the sugar beet resulting from selection.)
C. R. Acad. Sci. Paris 1931 : **192** : 504–07.

The author concludes that the quantity of mineral bases, combined bases and organic acids is not constant, but decreases with the rise in sugar content resulting from selection. High sugar varieties hence remove less mineral salts from the soil.

561 **Eghis, S. A.** 633.71:575.127.2

Experiments in interspecific hybridization in the genus *Nicotiana*. II. The sterile hybrids between *N. rustica* L. and *N. silvestris* Speg. and Comes.
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1931 : **2** : 57–84.

Fertile pollen was obtained from a bud on a fluctuating branch of the F_1 hybrid of *N. rustica* x *N. sylvestris* and was used for selfing and as a back-cross with *N. rustica*. The one F_2 plant obtained was cytologically investigated in bud and found to be an allotetraploid. More or less sterile plants obtained from another experiment differed from the sterile forms in their external characters. They had 60 chromosomes and were triploids.
Another plant was quite sterile with 48 chromosomes and represented a matroclinous form of the hybrid *N. tabacum* x *N. sylvestris*.
The significance of these polyploid hybrids is discussed.

562 **Lammerts, W. E.** 633.71:575.127.2

Interspecific hybridization in *Nicotiana*. XII. The amphidiploid *rustica-paniculata* hybrid. Its origin and cytogenetic behaviour.
Genetics 1931 : **16** : 191–213.

The F_1 of the cross *rustica-paniculata* with 12r + 12p was used as the male parent in the backcross to *rustica pumila*. Of the surviving plants the majority resembled *rustica pumila* had 24m chromosomes and sometimes selfing was suspected. Others with 24 m differed from rustica and from each other. For the rest, the results of 1928 and 1929 showed three with 28m + 4r 2 with 26m + 6r 2 with 26m + 4r 3 with 19m + 5r and 4 with 18m + 6r. There was no correlation between chromosome number and fertility.
The plants obtained by selfing the F_2 could be divided into three groups according to chromosome number.

1. 14m + 14r and 17m + 7r : the plants resembled *rustica pumila* and were almost completely sterile.
2. Plants with 54–55 and 57–58 chromosomes the result of the union of diploid and haploid gametes.
3. A large class of amphidiploids with approximately 72 chromosomes and high fertility. Plants of group 3 were selfed and the progeny showed a comparable variation. The chromosome behaviour was very irregular. F_4 was still more variable. These amphidiploids were backcrossed with *rustica pumila* and *paniculata* but there were no survivals. The pairing of the chromosomes of the diploid gametes suggests that lack of pairing is not a necessity in amphidiploid formation and the possibilities of this new arrangement are discussed.

563. **Rybin, V. A.** 633.71:575.12[9]

(Cytological features of the allotetraploid *Nicotiana tabacum* x *Nicotiana sylvestris*.
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1931 : **2** : 437–45.

From the usually completely sterile F_1 of *N. tabacum* x *N. sylvestris*, a plant was obtained by selfing a bud, on a branch which had been previously chloroformed for ten minutes.
Morphologically the plant showed a more marked resemblance to *N. sylvestris* than did the normal F_1 hybrids.
Cytological investigations showed that the parent plant had 36 somatic chromosomes but the plant in question was tetraploid with 72. It had a regular reduction division and was fertile but somewhat less so than the pure species.

564. **Kostoff, D.** **633.71:576.356:578.088**
Heteroploidy in *Nicotiana tabacum* and *Solanum melongena* caused by fumigation with nicotine sulphate.
Bull. Soc. Bot. Bulgar. 1931 : **4** : 87–92.
In those buds which did not fall after fumigation, irregular meiosis was observed. One of the *N. tabacum* plants, produced by pollinating normal plants, had 28 instead of 24 haploid chromosomes, another 29, with larger flowers and leaves. Both were semi-fertile.

565. **Hall, C. J. J. van** **633.73**
633.73:575
A review of the most important publications on coffee issued in the second half of 1929 and the first half of 1930.
Int. Rev. Sci. Pract. Agric. 1930 : **21** : 371–76, 411–16.
The origin on the Kawisari estate in Java of the hybrid of *arabica* and *liberica*, which proved to be different from its parents in being resistant to leaf disease, is mentioned. The problem was finally solved by the introduction of *robusta*.
The varieties grown, and the quality of the produce, are described for a number of other countries where coffee is being cultivated.
An account is given of the Java selection work as described by Dr. Hille Ris Lambers at the 4th Pacific Science Congress.
Superior mother trees are selected much as in the case of rubber. Crosses have been made with a view to high yield, large beans and resistance to leaf disease and berry borer. Promising hybrids are propagated by grafting but this is distinctly less successful than in the case of rubber.

566. **Kassayeva, M. A.** **633.75:575.127.2**
(Hybridization experiments between *Papaver somniferum* L. and *Papaver bracteatum* Lindl.)
Proc. U.S.S.R. Congr. Genet. Plant-and Animal-Breed. 1930 : **2** : 295–306.
Papaver somniferum is easily pollinated with *P. bracteatum* but the reverse cross did not succeed. There was clearly marked predominance of the characters of the pollen parent. Several kinds of monstrosity occurred. The F_2 generation was also obtained.

567. **Ruttle, M. L.** **633.822:576.312.35**
The bearing of cytological studies on breeding possibilities in the genus *Mentha*.
Proc. Amer. Soc. Hort. Sci. 1930 : 335–36.
Investigations have shewn that the species of *Mentha* have very different chromosome numbers and this has shed light on the interrelationships of the species.

568. **Dale, E. E.** **633.842:575–181.13**
Inheritance of dwarf in *Capsicum*.
Pap. Mich. Acad. Sci. 1931 : **13** : 1–4.
F_1, F_2 and backcross progenies of a dwarf type appearing in the variety Coral Gem prove the character to be a simple recessive and indicate that the original Coral Gem was heterozygous. Pure normal plants were obtained by self-pollination.

569. **Dale, E. E.** **633.842:575.182.061.633**
Maternal inheritance in a chlorophyll variegation in *Capsicum.*
Pap. Mich. Acad. Sci. 1931 : **13** : 5–8.
A single variegated plant appeared in the progeny of the backcross Coral Gem x F_1 (Coral Gem x Anaheim). Self-pollination of green branches produced only green offspring, of pale branches only pale. On crossing flowers of different types maternal inheritance occurred.

570. **Arnoldova, O. N.** * **633.854.78:575.25**
(The phenomenon of vegetative segregation in the F_1 hybrid from a cross of an annual sunflower with a perennial one.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 139–40.
Very many attempts were made before this cross succeeded. The hybrid resembled the perennial parent in the majority of its characters and was completely sterile. It gave tubers however, and these were remarkable in that they differed markedly among themselves, shewing clear signs of vegetative segregation.

571. **Plachek, E. M.** * **633.854.78:576.16:575**
(Form originating processes in the sun-flower under the influence of hybridization and inbreeding.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 395–96.
A particular variety of sunflower (*Helianthus annuus*) was crossed with *H. cucumerifolius.* In reciprocal crosses the F_1 in every case resembled the female parent in most of its characters. These characters also predominated in F_2. Several interesting new forms have emerged and the results have led the author to remove this variety and establish it as a separate species, *H. macrospermus* Platshek.

572. **Chevalier, A.** **633.855.341(44)**
Le Palmier à huile à la Côte d'Ivoire.
(The oil palm in the Côte d'Ivoire.)
Rev. Bot. appl. 1931 : Bull. 116 : 213–29.
In the section on selection it is pointed out what vast differences exist in the percentage of pulp from one variety to another. The author stresses the necessity for selection for high percentage of pulp and kernels together with high fertility which is constant from year to year.

573. **Bregger, J. T.** **634.1/2:575.252**
The prevalence and commercial importance of bud mutations in the deciduous fruits.
Proc. Amer. Soc. Hort. Sci. 1930 : 425-29.
The importance which bud mutation has played in the evolution of present-day cultivated fruit varieties is emphasized, reference being made to the apple, peach, pear, cherry, plum and apricot. The numerous cases of coloured strains having arisen in this way are pointed out and it is concluded that this will be a valuable source of new variations in the future.

574. **Kostoff, D.** **634.1/2:576.356:578.088**
(Studies on the sterility in certain fruit trees.)
Sci. Pub. Bulgarian Agric. Soc. 1931 : no. 28 : 63 pp.
The quality of the pollen, percentage of sterility, together with the chromosome number and degree of irregularity of meiosis are reported for a number of stone and pome fruits. The irregu-

* **A full translation of this paper is filed at the Bureau.**

larities of meiosis are increased by sudden temperature changes, certain insecticides, etc., insect attack, grafting and other agencies. Unbalanced, heteroploid embryos were frequently the cause of fruit fall. Heterosis has been observed in intervarietal crosses in plums.

575. **Riabov, J. N.** **634.1/7:581.162.3**
(The problems of pollination and fertilization of fruit trees.)
J. Gov. Bot. Gdn. Nikita 1930 : **14** ; 259 pp.

The author reviews the literature very fully and makes a number of conclusions on which he bases a number of deductions of practical nature. The condition in apples, pears, cherries, plums, apricots, peaches and almonds is described. Phenomena of cross- and self- sterility and incompatibility are discussed, together with the innumerable factors affecting them, the three phases of dropping of fruits, parthenocarpy and xenia.

576. **Lantz, H. L. and Edgecombe, S. W.** **634.11:575**
Apple breeding : some significant differences in the vigor and grade of cross-bred apple seedlings.
Proc. Amer. Soc. Hort. Sci. 1930 : 289–95.

Apple varieties differ in their ability to transmit vigour. The variety Sharon gave progenies of uniformly high vigour, whereas other varieties give progenies in which there is a marked degree of variation in vigour of growth. By statistical tests of the variation in vigour of the progeny the varieties tested could be arranged in three groups.
In the case of Sharon the progenies were equally vigorous whatever the other parent and it is suggested that types might be built up with the capacity to transmit a group of desirable qualities in this way.

577. **Kimball, D. A.** **634.11:575.12**
A study of the progeny resulting from crossing certain apple varieties.
Proc. Amer. Soc. Hort. Sci. 1930 : 412–15.

The time of ripening, flavour, flesh texture and general quality of the progenies of a number of crosses is reported briefly, after which the value as parents of the varieties used is discussed with regard to the various characters under investigation.
Two valuable seedlings have been obtained and are being distributed.

578. **Nebel, B. R.** **634.11:575.182**
Xenia and metaxenia in apples.
Tech. Bull. N.Y. Agric. Expt. Sta. 1930 : **170** : 16 pp.

Two trees of one variety were crossed with the pollen of two different varieties and several characters of the resulting fruits were carefully analysed. Very slight differences, due it is suggested to metaxenia were found.

579. **Howlett, F. S.** **634.11:576.356**
Chromosome irregularities in the development of the megaspores of Stayman Winesap.
Proc. Amer. Soc. Hort. Sci. 1930 : p. 411.

Chromosome irregularities are described which contribute to the failure of fertilization in the variety Stayman Winesap of an unnamed fruit, apparently the apple.

580. **Burrell, A. B. and Macdaniels, L. H.** **634.11:581.162.3**
Further pollination studies with the McIntoch apple in the Champlain valley of New York.
Proc. Amer. Soc. Hort. Sci. 1930 : 374–85.

It is shewn that although cross-pollination with very potent pollen gives a greatly enhanced crop yet this may result in an almost complete failure in the following year. More moderate pollination with a less potent pollenizer is therefore recommended.

581. **Dullum, N.** **634.11:581.162.32**
Undersgølser angaaende Krydsbefrugtning af Æbler.
(Investigations on the cross-pollination of apples).
Tidsskr. Planteavl. 1930 : 36 : 350–53.

Gul Graasten, pollinated with 12 other varieties for two years gave the highest average set of fruit with Filippa, Billingæble, Ondrup Moseæble, Gyllenkroks Astrakan and Transparente blanche, arranged in order of merit.
Bellefleur de France and Bramleys Seedlings proved to be practically self-sterile. The best pollinator for Bellefleur de France was Lane's Prince Albert. For Bramleys Seedling, Filippa and Mølleskov were best. Lane's Prince Albert is also self-sterile and its best pollinators are Mølleskov and Filippa. Mølleskov set little fruit when self-pollinated but set a good crop when pollinated with Lane's Prince Albert.

582. **Lommel, W. E and Greene, L.** **634.11:581.331.2**
Some effects of late spring frosts upon the viability of apple pollen.
Proc. Amer. Soc. Hort. Sci. 1930 : 404–05.

The pollen of different varieties differs in its capacity to remain viable after exposure to temperatures below freezing point.

583. **Nebel, B. R.** **634.13:576.356**
Recent findings in cytology of fruits (cytology of Pyrus III).
Proc. Amer. Soc. Hort. Sci. 1930 : 406–10.

A discussion of the views of Darlington and others in which it is not admitted that the explanations offered for post-diakinetic clumping are the only possible ones.

584. **Overley, F. L. and Overholser, E. L.** **634.13:581.162.3**
Beurre d'Anjou pollination studies in Washington for 1930.
Proc. Amer. Soc. Hort. Sci. 1930 : 397–99.

In the Beurre d'Anjou pear higher sets were obtained when cross-pollination was prevented than under conditions of open-pollination. The variety is partially self-sterile and the best sets were obtained by pollination with certain varieties which proved to be good pollinators for the Beurre d'Anjou.

585. **Shapiro, N. D.** **634.13:581.162.3**
(Determination of the influence of the staminate parent on the quantitative formation of pear fruits.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : 2 : 565–66.

Varieties could be classed as good, intermediate and bad pollinators with relation to a particular maternal variety. The quality of the individual pollinator also influences the vigour of the fruits.

586. **Kinman, C. F.** **634.23:575.252**
A study of some unproductive cherry trees in California.
J. Agric. Res. 1930 : **41** : 327–35.

A mutant of the type of a bud sport occurred in cherries, characterized by abnormal blossoms and fruits. The abnormality was not transmitted to normal scions grafted or budded on to the abnormal plant and appears to be a true mutant.

587. **Trochain, J.** **634.58–2.8**
La " Lèpre " de l'Arachide au Sénégal.
(" Leprosy " of groundnuts in Senegal.).
Rev. Bot. Appl. 1931 : 11 ann. 330–34.

Two diseases are described both causing great reduction in yield. " Gana," from a local word meaning leprosy, is a mosaic disease probably carried by insects. The other known as " Guerté bougor " or rosette is described as a physiological disease resembling " clump " and is thought to be hereditary.
Roguing is found to be the most effective method of control for both diseases but there are varieties resistant to rosette and early sowing is advocated as the plants are not usually attacked till later in the growing season.

588. **Colby, A. S.** **634.711–2.483–1.521.6:575**
Some raspberry varieties being used as parents in breeding.
Proc. Amer. Soc. Hort. Sci. 1930 : 422–24.

Progenies involving several thousand plants of first and second generation crosses and selfings are under observation. In judging the value of varieties as parents, resistance to anthracnose is of primary importance.
One cross gave progeny more resistant than either parent and with excellent fruiting characters. Other valuable hybrids have also arisen.

589. **Wellington, R.** **634.835.091**
The value of the European grape in breeding grapes for New York State.
Proc. Amer. Soc. Hort. Sci. 1930 : 416–21.

The inheritance of stamen character, winter-hardiness, colour and quality of fruit, etc., in a number of crosses is described and the value of the different varieties as parents is deduced. Certain valuable seedlings were produced.

590. **Cordier, D.** **634.835.094**
Les hybrides.
(Hybrids)
Rev. Vitic. Paris 1931 : **74** : 133–38.

The author deprecates the cultivation of hybrid direct producers.

591. **Coulondre, E.** **634.835.094**
L'hybride est-il appelé à jouer un rôle en viticulture ?
(Is the hybrid to play a part in viticulture ?)
Rev. Vitic. Paris 1931 : **74** : 281–86.

A reply to M. Cordier in which the author insists on the value of hybrid direct producers and the quality of their wine.

592. **Rouart, E.** **634.835.094**
Les hybrides de vigne dans la region toulousaine.
(Grape hybrids in the region of Toulouse.)
C. R. Acad. Agric. Fr. 1930 : **16** : 96–102.
A discussion of hybrid direct producers, in which it is pointed out that recent work has succeeded in eliminating their previous defects one by one. Trial plantations are proving highly satisfactory and the author considers that the ideal type will be produced in the near future.

593. **Rieman, G. H.** **635.25–2.4–1.521.6:575.11.061.6**
Genetic factors for pigmentation in the onion and their relation to disease resistance.
J. Agric. Res. 1931 : **42** : 251–78.
Artificial cross-pollination was effected and about 50 per cent. of the crosses were successful. An examination was made of 330 progenies, from which it was concluded that the colour classes red, yellow, red neck and white were governed by the following genes :— I for complete inhibition of colour, i for expression of colour, W for red pigment, Wy for yellow pigment and w for white, the last three being multiple allelomorphs. I is incompletely dominant to i so that the heterozygote is a plant of the red-neck type in presence of red pigment and a cream plant in presence of yellow pigment.
A very limited number of F_1 plants was obtained but these were selfed and intercrossed and gave progenies which conformed to expectation on the basis of the above factorial interpretation. A number of F_2 plants were selfed and F_3 and F_4 results conformed to expectation. The gene W for red proved to be dominant to Wy for yellow and w for white. It still remains to prove that Wy is dominant to w, finally establishing the allelomorphic series.
The various stocks were subjected to both field and laboratory tests with the smudge organism. *Colletotrichum circinans*. The effect of pieces of dry scale of the various types on spore germination was also tested ; plants were classed as resistant, intermediate and susceptible. On the basis of these tests coloured bulbs proved to be resistant. In a progeny segregating for red and white the red individuals were mostly resistant, the red-neck individuals contained intermediate and susceptible plants in the proportion 1 : 4, whilst the white and cream class contained intermediate and susceptible in the proportion 1 : 12, and in pure breeding white progenies the proportions were 1 : 35 ; white intermediate resistant bulbs occurred more frequently in progenies segregating for red and white than in pure breeding white progenies. This is accounted for by the incomplete epistasis of the heterozygous inhibitor Ii over W and Wy. It therefore seems probable that a white resistant type may be produced.

594. **Kakizaki, Y.** **635.34:575.242.061.6**
A dominant white-flowered mutant of *Brassica oleracea L.*
Jap. J. Genet. 1930 : **6** : 55–60.
A strain of yellow-flowered *Brassica oleracea* produced a white plant whose breeding behaviour shewed it to be heterozygous for a dominant white factor. The dominant white factor seems certainly to have been produced by mutation.

595. **Lewis, M. T.** **635.52–1.547.4:575**
Inheritance of heading characteristics in lettuce varieties.
Proc. Amer. Soc. Hort. Sci. 1930 : 347–51.
Fifteen crosses involving ten varieties and 7893 F_2 plants were examined for head type. No precise analysis of the results could be made, multiple factors being clearly involved in the wide variation of types appearing in F_2.

Certain crosses proved to be more hopeful than others. In crosses involving the crisp-headed type the F_2 rarely contains individuals superior to the parents; this does sometimes happen in the cabbage-butterhead types.

596. **635.611–2.42–1.521.6**

Scientists develop muskmelons resistant to powdery mildew.
Off. Rec. 1931: **10**: p. 99.

A brief reference to the breeding of resistant melons in California.

597. **Porter, D. R.** **635.615:575.14**

Some effects of inbreeding in watermelons.
Proc. Amer. Soc. Hort. Sci. 1930: 554–59.

The work of numerous writers is referred to, in which it is shewn that no ill effects are to be expected from inbreeding in the *Cucurbitaceae*.
The present observations indicate that no decrease resulted from inbreeding in the case of vine vigour, average yield per plant, average weight of fruit and number of fruits. Some inbred lines exceeded the parent, and after four generations of inbreeding, lines were isolated which were in no way inferior to the parent variety but exceeded it in uniformity and quality.

598. **Tezima, T.** **635.646:575.127.2**

Sur l'inégalité des croisements réciproques entre *l'Hibiscus Manihot* et l'*H. esculentus*.
(On the dissimilarity of reciprocal crosses between *Hibiscus Manihot* and *Hibiscus esculentus*.)
Proc. Crop Sci. Soc. Japan 1930: **2**: 230–34.

When the former variety is used as female parent the hybrid is quite fertile but the reciprocal cross yields no seed at all. Similarly the backcross of F_1 with *H. esculentus* was unsuccessful when the F_1 was the female parent, the reverse being successful. No explanation can be offered for these results.

599. **Sveshnikova, I.** **635.651:575.127.2:576.356**

(Reduction division in the hybrids of *Vicia*.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930: **2**: 447–52.

The characters of the chromosomes in various species are given; various morphological distinctions of the chromosomes exist.
In crosses with *V. amphicarpa*, the small additional F chromosome of *V. sativa* united with one of the large chromosomes, leaving its homologue free as a univalent.
In hybrids with other species, the F chromosome behaved in various different ways, obeying no general scheme but sometimes conjugating, sometimes not conjugating, or uniting with bivalents.

600. **Tjebbes, K.** **635.652:575.116.1**

Two linkage groups in the garden bean.
Hereditas, 1931 : **15** : 185–93.

A close linkage was found between the factors B causing a pale yellow colour in the presence of A, R causing a pale wine-red colour with A, and S that limits the red colour to stripes and patches. Crossing over was less than one per cent.
Another linkage was found between C, causing a greyish yellow in the presence of A only, and giving a brown umbilical ring, and G, one of an allelomorphic series and causing green leaves but yellow pods.
In this case the linkage was loose with about 35 per cent. of crossing over.

601. **635.655**

Plant explorer brings back new soyabean varieties from Orient.
Off. Rec. 1931 : **10** : 113 and 115.

A large number of varieties have been collected in the Far East and amongst them it is expected to find many new types valuable for cultivation in the U.S.A.

602. **Fedotov, V. S.** **635.656:575.11.061.6:581.46**

(On the hereditary factors of flower colour and of some other characters in the pea.)
Proc. U.S.S.R. Congr. Genet. Plant- and Animal-Breed. 1930 : **2** : 523-37.

From crosses made with new forms of peas found by the expeditions of the Institute of Applied Botany the following new factors have been identified :—

Cr which changes the crimson flower colour to purple in the presence of A.
Cv an intensifier of the anthocyan colour in the presence of A and B.
Cm causes the cream flower colour independent of A and hypostatic to Cv.
Bl without which B is ineffective.
Fp another factor for the dotting of the seed coat, hypostatic to F and shewing independent segregation with E.

603. **Renard, E. J.** **635.656:575.73:581.162.32**

Origin and nature of rogues in canning peas.
Res. Bull. Wisc. Agric. Expt. Sta., 1930 : **101** : 1–56.

To determine the cause of the variations or mutations so often reported in canning peas, the number of variant individuals occurring in various stocks of two important commercial varieties was noted over a period of three years.
Of those plants picked out as rogues, over 98 per cent differed from the normal in their hereditary constitution. Many of these rogues shewed Mendelian segregation in their progenies.
Certain rogues had coloured flowers and their progeny was identical with that of artificial hybrids between normal plants and plants with coloured flowers.
Abundant evidence is adduced to shew that these rogue plants were the result of natural crossing and it was shewn that some varieties are much more subject to out-pollination than others. Some of the natural hybrids display a considerable degree of natural crossing.
When single plant progenies of the same varieties were grown under conditions precluding out-pollination no hereditary variants occurred.

Rogues found in Alaska, a variety popularly supposed to be very prone to produce rogues, gave complicated genetic ratios whilst pure lines of the variety grown under isolated conditions again gave no sign of rogues.
No rogues were produced as a result of particularly high conditions of soil fertility. Plants bearing double-podded peduncles did not display any more tendency to produce rogues than normal plants.
The amount of non-hereditary fluctuation normally occurring within a pure line is indicated.

604. **Bunten, I.** **635.656:576.312.35**
A preliminary report on the chromosome complement of "rabbit-eared rogues" in culinary peas (*Pisum sativum* L.)
Amer. J. Bot. 1930 : **17** : 139–42.
Chromosome counts were made of plants of the narrow stipuled dominant mutation described by Bateson and Pellew, in which the progeny from upper nodes shewed a higher percentage of rogues than the lower. The chromosomes were apparently quite normal.

605. **Håkannsson, A.** **635.656:576.356.1**
Über Chromosomenverkettung in *Pisum.*
(Chromosome chains in *Pisum.*)
Hereditas, 1931 : **15** : 17–61.
It has already been shewn that those plants in which genes A and Gp are coupled have a ring or chain of 4 chromosomes and half the pollen is sterile. The paper presents a full study of this material. In three separate cases of semi-sterility this ring or chain formation has been observed.
A full description is given of the chromosome morphology and behaviour in the normal plant. Four chromatids were clearly distinguished in the bivalents.
The ring plants are referred to as amphidiploids. The association between the chromosomes is similar to that between normal bivalents and does not at all resemble that occurring in quadrivalents. The various ways in which the ring chromosomes may behave and divide are described.
The number of cases in which the chromosomes are arranged alternately is equal to that in which they are not alternate ; it is assumed that the 50 per cent good pollen arises from this former case, in which one chromosome of each type goes to each pole. The irregular chromosome distribution in the latter case causes 50 per cent bad pollen.
In the formation of the embryosac mother cells the 4 chromosomes pass together into one cell, causing one half of the ovules to be sterile.
Other cases of linkage were observed in which there was no abnormality in the maturation divisions and in these cases no sterility occurred. Such linkage is evidently of a different nature.
Similar cases observed by other authors are discussed and it is concluded that the ring is the result of crossing over between non-homologous chromosomes in one of the parents.

606. **Walker, J. C.** **635.656–2.484–1.521.6**
Resistance to *Fusarium* wilt in garden, canning and field peas.
Res. Bull. Wisc. Agric. Expt. Sta. 1931 : **107** : 15 pp.
Large numbers of peas were examined with a view to discover whether selection for *Fusarium* resistance would be profitable and which varieties might serve as parents in breeding for resistance.
In the variety Alaska great variation was found in the resistance of different stocks, from 0 to 75 per cent of resistant plants being found and in one case 100 per cent.
In the variety Perfection no resistant stocks of the pure Perfection type were discovered.
Most of the other varieties tested contained resistant individuals, some in high, some in rather low proportions. These proportions are tabulated.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by Percy Lund, Humphries & Co. Ltd.

(862) Wt.P.1434/168/41715. 50. 11/40. P.L.H. & Co. Ltd. G.943.

INDEX.